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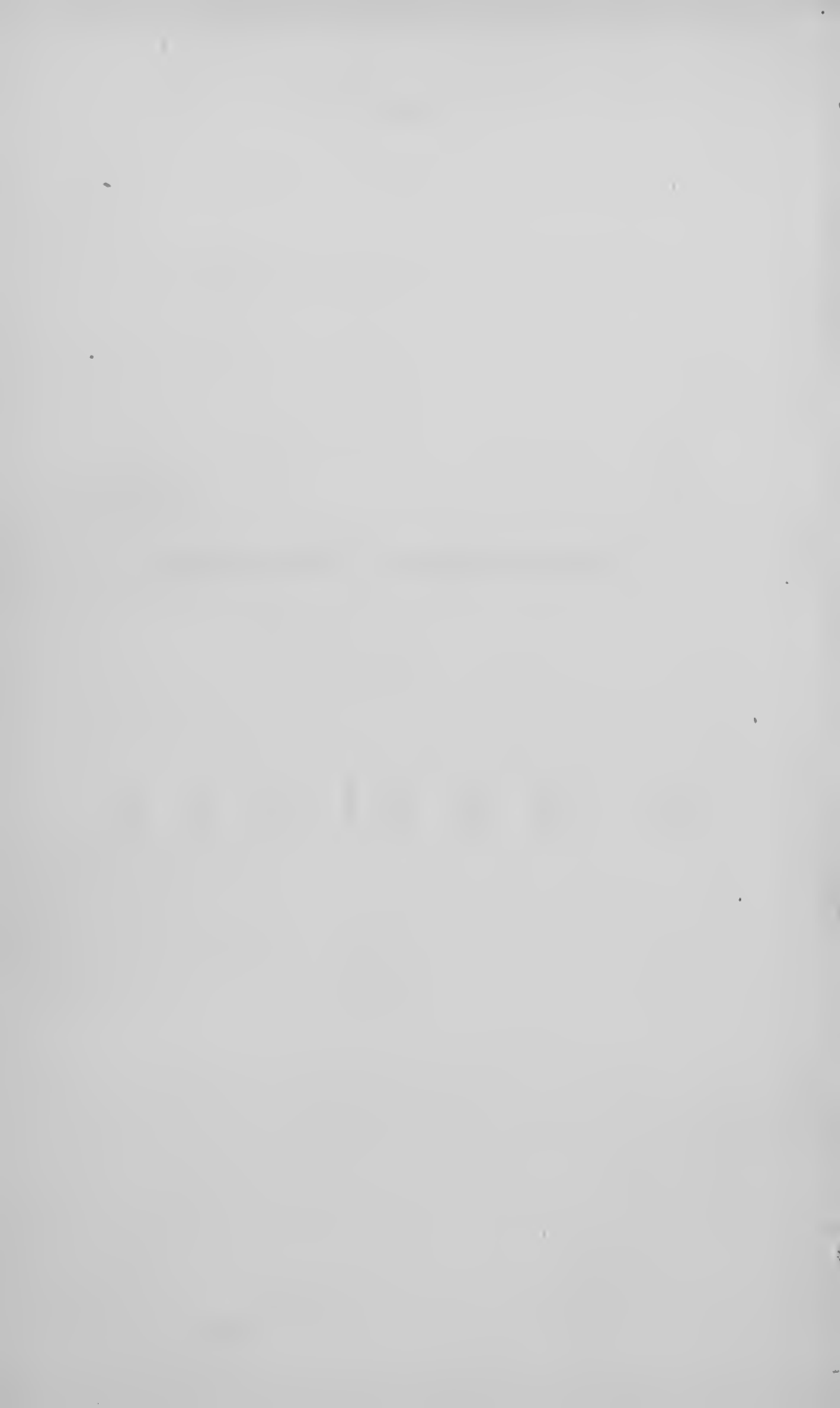
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OF
M I D W I F E R Y.

BY
DAVID H. TUCKER, M. D.

PROFESSOR OF THE PRINCIPLES AND PRACTICE OF MEDICINE, AND FORMERLY OF
OBSTETRICS, AND THE DISEASES OF WOMEN AND CHILDREN IN THE
FRANKLIN MEDICAL COLLEGE OF PHILADELPHIA.

WITH NUMEROUS ILLUSTRATIONS.



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P R E F A C E.

IN undertaking the preparation of a concise and practical treatise upon Obstetrics, we at first proposed to translate either the work of Cazeaux or Jacquemier; but it was found impossible to comprise within the prescribed limits of this work, either of these excellent treatises. The mutilation of these works did not accord with our taste, nor did we think such a plan could be adopted without doing injustice to the character of the works to which we have alluded. For these reasons, and for these reasons only, we have undertaken the compilation of a treatise upon Midwifery, without the slightest claims to originality, but based upon the valuable materials derived from the numerous works, both American, English and French, which have been published within the last few years.

In the execution of this work, we have drawn freely and unreservedly from the best writings within our reach. In the text, we have generally given the names of those whose opinions have been quoted; but lest this, our intention, may occasionally have been neglected, we take this opportunity of acknowledging our obligations to those authors from whom the materials are drawn.

In arranging the anatomical portion of the work, we have principally consulted the Dublin Dissector and the Anatomy of Prof. Horner of this city. The physiology of the functions of menstrua-

tion and generation have been fully explained, and without adopting exclusively the new views, lately proposed upon these subjects, we have not hesitated, by constant reference to the works of Bischoff, Raciborski, Ritchie and Pouchet, to place the reader in complete possession of the grounds upon which these theories are based. From the able review of these new doctrines by Dr. Charles H. King of this city, (see *American Journal of Medical Sciences*, 1844,) and from the physiological works of Dunglison and Carpenter, we have obtained much valuable information.

In regard to the development of the fœtus, the formation and arrangement of its membranes and their connexion with the interior of the uterus, we have been as brief as possible, and the opinions adopted by us upon this subject are mere modifications of those advanced by Carpenter, Lee, Weber, Reid, &c.

In treating of pregnancy—its signs, its diseases, and its duration—we have derived much valuable matter from the various authors who have written upon the subjects, but especially from the excellent work of Dr. Montgomery, which should be in the hand of every practitioner of Medicine.

In our description of the phenomena of labour, the works of Dewees, Rigby, Blundell, Ramsbotham, Gooch, Moreau, Cazeaux, Jacquemier, and others, have been referred to. The mechanism of labour has been fully but concisely described, and in this description we have pursued a medium course, avoiding on the one hand the extremely tedious details of the French writers, and on the other, the inaccurate description of this process observable in most of the British works upon obstetrics.

In our chapters on the accidents of labour, we have consulted most of the authors above mentioned, and it will be seen that in treating of uterine hemorrhage, we have inserted a portion of Dr. Simpson's pamphlet upon the management of placenta prævia

cases, and the whole of Dr. Radford's article upon the effects of galvanism in inducing uterine contraction.

In our chapter upon pelvic deformities, we have inserted a translation of Nacgelè's remarks upon the obliquely oval pelvis. In addition to this, we have treated of the other varieties of pelvic deformities, of their diagnosis, &c., &c.

The various modes of delivering the female artificially, whether with instruments or not, have been detailed, and from the statistical tables of Dr. Churchill, we have obtained much valuable information in regard to the relative mortality of these different operations.

So much for our authorities; and it now only remains for us to say, that in the execution of the work, we have endeavoured to detail in plain, concise, but intelligible language, the principles of obstetrical practice, indulging the hope, that it may prove useful to the medical student, for whom it is especially intended.



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M I D W I F E R Y.



CHAPTER I.

SECTION I.—BY the term Midwifery, we mean that branch of the science of medicine which treats of the management of females during pregnancy, labour, and the puerperal state.

In a treatise on midwifery, the pelvis first claims attention, since an accurate knowledge of its anatomy, and of the organs it contains and protects, is absolutely essential to a proper comprehension of the process of parturition.

The pelvis is a bony cavity of irregular shape, situated between the vertebral column above and the femoral bones below. It is composed of several bones, which we will now describe.

Os Sacrum.—This bone is pyramidal or triangular in shape, and is placed at the posterior part of the pelvis, articulating laterally, with the ossa innominata; inferiorly its apex is united with the coccyx, and above its base is joined to the last lumbar vertebra, forming a projection into the pelvic cavity, called the promontory of the sacrum. The structure of this bone is spongy and cellular internally, being covered externally by a thin lamina of compact substance. The os sacrum, in early life, is composed of five distinct pieces, which in the adult are firmly consolidated, leaving four transverse seams or ridges indicative of the original separation. The posterior face of the sacrum is rough and convex, presenting along the central line four eminences, analogous to the spinous processes of the true vertebræ. On either side of these processes there are four openings, for the transmission of the sacral nerves from the spinal canal; and, external to these foramina, we find a number of processes, similar to the transverse processes of the true vertebræ. These numerous processes serve as points of attachment to muscles and ligaments, and the hollow space existing on either side, between

the spines of the sacrum and the os innominatum, is filled up completely with a mass of muscular structure. The lateral surfaces of the sacrum may be divided into two portions; the one is rough and expanded, for articulating with the ossa innominata; the other is thin and smooth, and receives the insertion of the sacro-sciatic ligaments. The anterior face of this bone is smooth and concave, presenting, on either side of the median line, the four anterior sacral foramina for the passage of the sacral nerves. The periphery of these openings is round and smooth, and the nerves, in passing to the lateral sides of the pelvis, are contained in grooves, so as to prevent, as far as possible, their compression, during the passage of the child through the pelvic excavation. The canal of the sacrum is a continuation of the spinal canal; it is triangular in shape, and diminishes in size to its lower extremity, where it terminates by an orifice, notched behind and exposing to view the last bone of the sacrum. The length of the sacrum is about $4\frac{1}{2}$ inches; the breadth of the base of the bone is 4 inches; and the thickness of the base is $2\frac{1}{4}$ inches. The depth of the concavity, or of the hollow of the sacrum, measures about three quarters of an inch, where the pelvis is well formed; but this incurvation varies considerably, and whether the bone be too straight or too much curved, it will equally impede the easy passage of the child through the pelvic excavation.

Os Coccygis.—This bone is pyramidal in shape, with its base pointing upwards and uniting, by an oval articular surface, with the sacrum. It is composed internally of cellular structure, covered externally with a lamina of compact substance. In very young persons, the os coccygis is formed of three or more pieces, which at a more advanced age become consolidated into one or two. The length of this bone is about $1\frac{1}{4}$ inches.

Ossa Innominata.—These bones are two in number, and form the lateral anterior and inferior portions of the pelvis. Each one of these bones is in early life separable into three distinct pieces; and though these in the adult become firmly consolidated, still anatomists have, for purposes of description, preserved the division into the *os ilium*, the *os pubis*, and the *os ischium*. The union of these separate portions takes place in the cotyloid cavity.

Os Ilium.—This bone forms the upper and lateral portions of the pelvis. The thick and narrow part of the ilium, which contributes

to the formation of the upper portion of the acetabulum, is called the body or base of the bone, from which the ala or wing arises; and passing upward and outward, it affords support and protection to the abdominal and pelvic viscera. The upper edge of each wing is curved, and is called the *crista ilii*. This crest is rough and thick, for the insertion of muscles, and terminates both anteriorly and posteriorly in an *anterior and posterior superior spinous process*. Under each one of these processes, there is a semicircular notch, terminating inferiorly in the *anterior and posterior inferior spinous process*. All of these processes serve as points of origin and insertion to muscles and ligaments. The external surface of the alæ ilii (termed the *dorsum ilii*), is convex, and gives origin to the gluteal muscles, while the internal face, or *venter ilii*, is concave; and that portion of it which is smooth is called the *fossa iliaca*, and is occupied by the iliacus internus muscle. The rest of the inner face is rough, and articulates with the sacrum. Below the posterior inferior spinous process, there is an arched sinuosity, forming, where the ilium and sacrum are united, the *sciatic notch*.

Os Ischium.—This bone occupies the lower part of the pelvis. Its base or body forms a considerable portion of the cotyloid cavity, and is very thick and strong. The inner face of this bone is smooth and slightly concave, and is called the *plane of the ischium*. Springing from the posterior part of the ischium, is the spinous process, which points backward and slightly inward. The inferior portion of the ischium, or that upon which we sit, is called the *tuber ischii*. It is strong and rough, for the origin of muscles. Passing obliquely upward from the tuber ischii is the *ramus ischii*, a flat process of bone which unites with the *ramus of the pubis*. The inner edge of the ramus, in the female pelvis, is turned outward for the purpose of affording as much space as possible for the passage of the head of the child, under the pubic arch. In the male skeleton, this peculiarity does not exist.

Os Pubis.—This bone may be divided into the body and into a horizontal and descending ramus. The body of the pubis is joined to its fellow of the opposite side, and the union is called the *symphysis pubis*. The anterior face of the body is concave and rough, for the origin of the adductor muscles of the thigh; but its posterior is nearly flat and smooth, contributing some little, however, to the

general concavity of the pelvis. From the side of the body of the bone, the horizontal ramus proceeds outward to meet the ilium. The superior face of the horizontal ramus is flat, and upon its outer and anterior portion is observed its spinous process, from which two eminences proceed, one passing outward, to be lost in the acetabulum; the other, running along the inner margin of the horizontal ramus, is called the *crista pubis*. This ridge is sharp and elevated, and forms the anterior third of the *linea ileo-pectineal eminence*. The descending ramus of the pubis passes down to meet the ramus of the ischium. These two rami form on the interior and inferior part of the pelvis the *arch of the pubis*, which is much wider in the female than in the male. Between the ischium and pubis, a large oval opening may be observed, called the *foramen thyroideum*. In the recent pelvis, this obturator or thyroid foramen, is closed by the obturator ligament and muscle, except at its superior edge, where a small opening exists for the passage of the obturator vessels and nerves.

SECTION II.—It will now be necessary to describe the articulations of the pelvis, and the numerous ligaments by which these articulations are rendered firm and solid. 1. The *sacro-iliac articulation* is formed by the corresponding rough surfaces of the sacrum and the ilium. Each of these articulating surfaces is covered by a layer of cartilage, between which there exists a thick yellow fluid which lubricates the parts. It is also said, that this joint is supplied with a synovial sac, very apparent in early life and during pregnancy, but disappearing in old age. The ligaments of this articulation are as follows:—1. The *sacro-spinous*, consisting of two laminæ, both of which arise from the posterior inferior spinous process, and are inserted, the one into the fourth and the other into the third transverse process of the sacrum. 2. The *ilio lumbar*, which passes from the transverse process of the last lumbar vertebra to be inserted into the crista ilii. 3. The *sacro-iliac ligaments*. These may be divided into an anterior and posterior portion: the former consists in a thin lamina of fibres, passing from the margin of one bone to that of the other; the latter, or posterior portion, is thick and strong. It arises from the posterior surface of the sacrum, and is inserted into the rough edge of the ilium, immediately behind its articulating surface. 4. The *posterior sacro-sciatic ligament* arises

from the posterior and inferior spinous process of the ilium, and from the margin of the sacrum and coccyx, and passes downward and outward to be inserted into the tuber ischii. This ligament is broad at its origin, but narrow and thick at its insertion. 5. The *anterior sacro-sciatic ligament* arises from the free margin of the sacrum and from all the bones of the coccyx; its fibres converge, and are inserted into the spine of the ischium. These two ligaments convert the sciatic notch into two foramina, the upper one of which is the largest, and transmits the pyriform muscle and the sciatic blood-vessels and nerves, while the lower foramen gives passage to the obturator muscle and the pudic artery.

2. The *Pubic Articulation* is formed between the bodies of the ossa pubis, the articular surfaces of which are covered by a thick layer of cartilage. The convex character of these articulating surfaces necessarily prevents their union, except to a limited extent, at the posterior part of the symphysis, and at this point there exists a synovial membrane. This joint is surrounded by a number of concentric ligamentous fibres, which, passing from one bone to the other, fill up completely the space between the two bones. A portion of these fibres, lying on the anterior face of the symphysis pubis, has been termed the *anterior pubic ligament*. The symphysis pubis is farther strengthened by the *sub* or *inter-pubic ligament*, which occupies the summit of the pubic arch. It is of a triangular form, about half an inch in breadth, and passes from the margin of one crus of the pubis to that of the other. It is remarkably strong and thick, and adds greatly to the strength of this joint.

3. *Sacro-coccygeal Articulation*.—The coccyx is united to the sacrum by a cartilaginous substance, resembling somewhat that which exists between the vertebræ. The bones of the coccyx are united with each other in the same way. These articulations are strengthened by two ligaments: 1. The *anterior coccygeal ligament*, which, arising from the inferior extremity of the sacrum, spreads over the whole anterior face of the coccyx, and is inserted into its extremity. 2. The *posterior coccygeal ligament* is placed posteriorly, and arises from the last bone of the sacrum, and is inserted into the second bone of the coccyx. These coccygeal articulations admit considerable motion in an antero-posterior direction, but none laterally. The movements of these joints gradually diminish in

advanced age, and may, in common with the other pelvic articulations, become the seat of disease.

4. The *Sacro-vertebral Articulation* resembles very closely that existing between the different vertebræ.

It has been considered by some that the symphysis pubis and the sacro-iliac synchondrosis, were destitute of motion, but it can no longer be doubted that there exists a slight mobility, especially where the movements of the body have been violent.

In some of the lower animals, the pelvic ligaments become relaxed and capable of considerable distension about the period of parturition. This fact, together with the assertion of some authors, that a similar relaxation occurs in parturient women, has induced the belief that, in this distensible condition of the ligaments, nature has wisely provided for the amplification of the pelvis, during the passage of the child through its excavation. But to render effective this increase in the size of the pelvic diameters, it must be apparent that a considerable separation of the joints would be required, and this could not take place without occasioning inconveniences more than counterbalancing the advantages gained. Without discussing this point more fully, we may conclude, that though the tissues about the pelvic joints become softer and more movable during pregnancy and parturition, yet no effective separation can occur, and when it does, it is to be regarded as highly unfavorable.

SECTION III.—Having studied the different bones forming the pelvis, and the manner in which these bones are united, it becomes necessary to consider the pelvis as a whole. The pelvis is of a conical shape; *its base*, when properly united to the vertebral column, looks upward and forward, while *its apex* is pointed downward and backward. If the os innominatum be examined, it will be seen that the direction of the expanded portion of the ilium and ischium is very different—in other words, the bone seems bent upon itself, so that while the ala ilii passes outward and upward, the body of the ischium passes downward and inward. At the point where the bone seems thus bent upon itself, a prominent ridge is observable, which forms a portion of the linea ileo-pectineal protuberance. This eminence may be described as formed by the crest of the pubis, and by the ridge to which we have just alluded, and continuous along the alæ of the sacrum, with the sacral promontory. It is this line

which divides the pelvis into two portions: 1, the *upper* or false pelvis, formed by the vertebral column behind, by the alæ ilii laterally, and in front, where the bony structure is defective, by the abdominal parietes: 2, the *lower* or true pelvis, bounded posteriorly by the sacrum and coccyx, laterally by the ischium, and anteriorly by the pubis. The entrance from the *upper* into the *lower* pelvis is called the *superior strait*, or the *brim*, or the *inlet of the pelvis*. The shape of the brim in the female, will represent, more or less accurately, an ellipse or a curvilinear triangle, the base of which is pointed posteriorly. The circumference of the brim measures, in the well-formed pelvis, 14 or 15 inches. The diameters of the superior strait are as follows, (see fig. 1.)

1. The *antero-posterior*, or *sacro-pubic*, or *conjugate diameter* (AA), running from the promontory of the sacrum to the superior edge of the symphysis pubis, measures from 4 to $4\frac{1}{2}$ inches.

2. The *transverse diameter* (BB), passing from one ilium to the other, measures 5 inches or more.

3. The *oblique diameter* (CC), extending from the sacro-iliac symphysis of one side to the opposite side of the brim, just above the acetabulum, measures 5 inches.

4. The *sacro-cotyloid space* (AC) measures from $3\frac{3}{4}$ to 4 inches.

If a piece of tin be cut so as to fit accurately the shape of the superior strait, it will, when placed along the pectineal line, represent the *plane* of that strait. In the natural skeleton, the union of the pelvis with the spinal column is such, that the plane of the pelvic brim (*ch*, fig. 2) is neither horizontal nor vertical, but forms, with a horizontal line, an angle of about 55° . This inclination, however, varies with the position of the individual; being greater

Fig. 1.

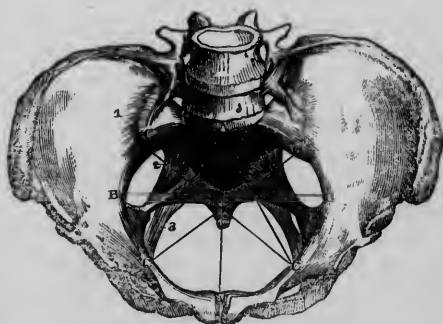
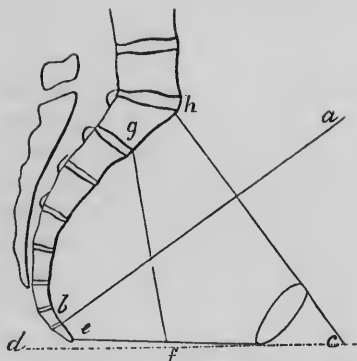


Fig. 2.



in the erect than in the recumbent position, and less, where the superior part of the trunk is inclined forward than where it is carried backward. The axis of the brim (*ab*) being a line drawn perpendicular to the centre of the plane of the superior strait, will be found to pass downward and backward, from the neighbourhood of the umbilicus, to the middle of the coccyx.

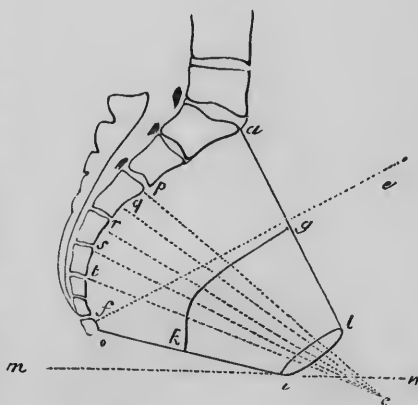
The inferior edge of the pelvis, called the *lower or perineal strait*, or the *outlet* of the pelvis, is formed by the extremity of the coccyx, by the sacro-sciatic ligaments, by the rami of the pubis and ischium, and by the symphysis pubis. The contour of this strait, without the ligaments, is irregular, presenting three large scallops; one in front, called the *pubic arch*, and one on either side, called the *sciatic notch*, which is converted into two foramina by the sacro-sciatic ligaments.

To avoid unnecessary complication, the plane of the inferior strait may be considered as extending from the point of the coccyx to the lower edge of the symphysis pubis; and its axis will be represented by a line (*gf*) drawn downward and forward from the first bone of the sacrum to the centre of the pelvic outlet.

Having ascertained the planes of the upper and lower straits, it is easy to understand, that all that portion of the pelvis, included between these two straits, constitutes the pelvic *excavation* or *cavity*. This cavity represents a canal whose curvature corresponds to that of the sacrum and coccyx. In consequence of this incurvation, it is perfectly clear that no straight line will traverse the centre of the pelvic excavation; hence, it will be necessary to ascertain what is the direction of the axis of this canal, for, without this knowledge, the student can never understand the mechanism of labour, nor can he undertake, with any hope of success, the various operations necessary in effecting artificial delivery. To illustrate this, we will sup-

pose a case in which the feet or breech have presented. After the body has been delivered, it may be necessary to hasten the delivery of the head, which still remains above the superior strait; and if in this case we draw downward and forward, in the *line of the axis of the inferior strait*, our efforts will be rendered useless, from the fact, that a portion of the head has become fixed over the symphysis pubis. If, however, the traction be made in the *direction of the axis of the superior strait*, viz., downward and backward, the head will readily pass through the brim of the pelvis, and as it descends *the line of traction must be gradually changed, so as always to correspond with the axis of that plane of the pelvis at which the head may have arrived.* M. Cazeaux has determined the axis of the pelvic excavation in the following manner (see fig. 3): he says,

Fig. 3.



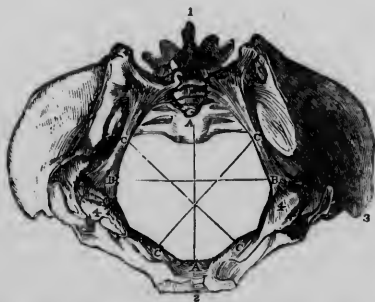
“To form an exact idea of the general disposition of the pelvic cavity, it seems best to cut that canal by a series of planes, passing from the point *c* (the point of intersection of the planes of the superior and inferior straits,) to the points *p, q, r, s, t*, of the anterior face of the sacrum. Each one of these planes will determine the opening of the pelvic cavity at that point. Now, to determine with precision the direction of the general axis of the excavation, it will be necessary to erect a perpendicular to the geometrical centre of each one of these sections, and to draw a line (*gk*) along the extremities of these perpendiculars. This line (*gk*) is curved, and is called the general axis of the pelvic cavity. It is easy to see that this line is nearly parallel with the anterior face of the sacrum, and its extremities are lost in the axes of the superior and inferior strait. This curve represents exactly the axis of the whole excavation; that is to say,

the line which the fœtus traverses in passing through the pelvis." It should be observed that the axis of the pelvis is not composed of two straight lines, nor does it form the *arc* of a circle, as has been supposed by Carus and others; but that its upper portion, which corresponds to the two first bones of the sacrum, is nearly straight, while the lower represents a curve parallel to that of the sacrum and coccyx. We will see hereafter that this curved axis is much extended, by the soft parts which lie between the extremity of the coccyx and the posterior commissure of the vulva.

The depth of the pelvic excavation posteriorly is about 6 inches, laterally $3\frac{1}{2}$ inches, and anteriorly the symphysis pubis measures from $1\frac{1}{2}$ to 2 inches. Its diameters are: 1. An antero-posterior diameter, extending from the symphysis pubis to the centre of the sacrum, measures $4\frac{1}{2}$ inches or more. 2. A transverse diameter, passing from the plane of one ischium to that of the other, measures about $4\frac{1}{2}$ inches.

The inferior strait is oval in shape, and if we compare its diameters with those of the brim, the proportions will be found to be reversed; though this change in proportion takes place gradually as we advance through the excavation. The diameters are: 1. The *antero-posterior* (AA, fig. 4), extending from the lower edge of the

Fig. 4.



symphysis pubis to the point of the coccyx, measures from 4 to 5 inches, allowing for the regression of the coccyx. 2. The *transverse diameter* (BB), extending from one tuberosity of the ischium to the other, measures about 4 inches. 3. The *oblique diameter* (CC), which passes from the

middle of the sacro-sciatic ligament of one side, to the point of union between the ramus of the ischium and pubis, of the opposite side, and measures about $4\frac{1}{2}$ inches.

By a reference to figure 5, it will be observed that the axis of the superior strait (*ab*) is not in a line with that of the body (*cd*), for while

the former passes downward and backward, the latter falls upon the symphysis pubis. Ramsbotham has stated very clearly the advantages of this arrangement, he says: "Were the axis of the trunk and the pelvic entrance in the same line, owing to the upright condition of the human female, the womb, towards the close of gestation, would gravitate low into the pelvis, and produce most injurious pressure on the contained viscera, while, in the early months, not only would the same distressful inconvenience be occasioned, but there would be great danger of its protruding externally, and appearing as a tumour between the thighs, covered by the inverted vagina." We may also add, that even in the non-pregnant state, the pelvic viscera would, but for this arrangement, be liable to constant prolapsus; both from the effect of gravity, and from the weight of the superincumbent viscera of the abdomen. Though these advantages are important, yet it must be borne in mind, that during parturition the labour will be much facilitated, by bringing the line of these two axes as nearly as possible into correspondence, which may be effected by flexing the body and the inferior extremities upon the pelvis.

Fig. 5.



The inclined planes of the Pelvis.—If the plane of the ischium be carefully examined, it will be found to consist of two planes; the one inclining downward and forward, the other downward and backward. The point which separates these two planes corresponds very nearly with the point where the broad ligaments are reflected from the uterus to the sides of the pelvis. The anterior inclined plane is

said to rotate the child's head round under the pubic arch, while the posterior produces a similar effect in the opposite direction.

The anterior plane is formed principally by the plane of the ischium; but the posterior, consisting partly of this bone, is continuous over the ligaments, &c., which close the sciatic notch. Even if these planes exist, as some have described, we will see hereafter that rotation is not effected by them, as is proved by the fact that it frequently occurs after the head has passed the inferior strait.

Characteristics of the Female Pelvis.—These have been clearly pointed out by Professor Francis, in his third edition of Denman's Midwifery; he says, "The pelvis of the female is less strong, less thick, and contains less osseous matter than that of the male. In the female the long diameter of the brim of the pelvis is from side to side; in the male, it is from before, backward; in the female, the brim is more of an oval shape; in the male, more triangular; in the female the ilia are more distant; the tuberosities of the ischia are also more remote from each other, and from the os coccygis, and as these three points are further apart, the notches between them are consequently wider, and there is, of necessity, a considerably greater space between the os coccygis and pubes than in the male. The female sacrum is broader and less curved than in the other sex. The ligamentous cartilage at the symphysis pubis is broader and shorter. In consequence of the cavity of the pelvis being wider in women, the superior articulations of their thigh-bones are further removed from each other, which circumstance occasions their peculiarity in walking; they seem to require a greater effort than men to preserve the centre of gravity, when the leg is raised. The greater distance between the anterior and superior spinous processes of the ilia, necessarily increases the length of Poupart's ligaments, forming the crural arch; on which account, less resistance being made to the abdominal viscera, females are more subject to femoral hernia than males. Sæmmering has remarked that the angle of union of the ossa pubis is, in the male, from 60 to 80 degrees, whereas in the female it is 90 degrees.

"According to the most accurate calculations, the mean height of the male, at the period of maturity, appears to be about five feet eight and a half inches; that of the female seems to be about five feet five inches, and the length of the different regions proportionally

less than in the male. A well-formed pelvis is generally allowed to have a circumference equal to one-fourth of the height of the female."

The dimensions of the male and female pelvis are given by Meckel as follows :

		In the Male.		In the Female.	
		Inches.	Lines.	Inches.	Lines.
The transverse diameter of the great pelvis between the anterior superior spinous processes of the ilia, - - - - -					
		7	8	8	6
Distance between the cristæ of the ilea, - -		8	3	9	4
Transverse diameter of the superior strait, -		4	6	5	0
Oblique do. of the do. -		4	5	4	5
Antero-posterior do. of the do. -		4	0	4	4
Transverse diameter of the cavity, - - -		4	0	4	8
Oblique do. of the do. - - -		5	0	5	4
Antero-posterior do. of the do. - - -		5	0	4	8
Transverse diameter of the lower strait or outlet, 3		0	4	5	
Antero-posterior do. of the do. 3		3	4	4	

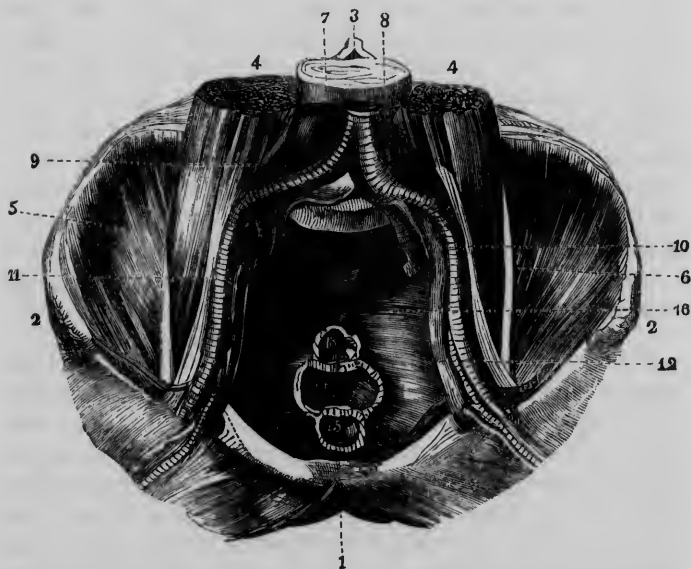
The latter may be increased to 5 inches, from the mobility of the coccyx.

Before concluding the description of the pelvis, it will be proper to advert to its uses. From its position between the vertebral column above and the acetabula below, it serves to support and transmit the whole weight of the body to the inferior extremities ; and so long as the bones, constituting the pelvis, retain their healthy condition, no deformity of its cavity can occur, except from direct violence ; but when disease, such as rickets, &c., attacks the pelvic bones, the pressure from above and the resistance from below, tend to force them inward towards the centre of the excavation, necessarily producing deformity, the character of which will of course depend upon the exact seat of the disease. Besides this obvious physiological use of the pelvic structure, there are others of equal importance to the obstetrician. The pelvis contains and protects, both in the male and female, many important viscera, and during pregnancy it gives support to the enlarged uterus. It is, however, during the process of parturition that a knowledge of its anatomy is so essential, for through its cavity the full-grown fœtus may pass without difficulty,

provided the size of its diameters, the direction of its axes, &c., be well understood.

SECTION IV.—Having now considered the pelvic bones and ligaments, we must study the muscles, blood-vessels, and nerves which occupy the cavity of the pelvis. The upper or false pelvis is lined with a mass of muscular structure. Externally, we have the *iliacus internus* (5, fig. 6), filling up the whole venter illii, and passing through the crural arch, to be inserted into the trochanter major.

Fig. 6.



On the inner edge of this muscle is seen the *psoas major and minor* muscles (4, fig. 6), coming from the vertebral column above, and passing downward along the pelvic brim, to be inserted into the trochanter minor. The *external iliac artery and vein* (11, 12, fig. 6) pass along the internal border of the psoas major muscle. The position of these muscles and blood-vessels is such as to change the shape of the pelvic brim, and to diminish the size of its transverse diameter, so that the oblique diameter of the brim would seem to be the largest; *in reality*, however, there is but little difference, owing

to the facility with which the soft parts are compressed, especially when relaxed by placing the female in a proper position.

The walls of the pelvic excavation are lined by the *pelvic fascia*, and by the following muscles: the *obturator internus*, the *pyramidalis*, the *coccygæus* and the *levator ani*. In addition to this, we find, contained within the pelvis, the *hypogastric blood-vessels*, the *sacral plexus* of nerves and their various branches. The *obturator nerve*, arising from one of the lumbar nerves, pierces the *psaos* muscle and passes into the pelvic cavity, to be transmitted, through the opening in the obturator ligament, upon the muscles of the thigh. The pressure of the fœtus, upon these nerves, as it passes through the excavation, often occasions violent pain during labour. These soft parts, with the bones already described, complete the parieties of the pelvic cavity; within which are contained, the *rectum*, *uterus*, *vagina* and *bladder*.

The outlet of the pelvis is closed up by a number of muscles, which act as the antagonists of the diaphragm and of the abdominal muscles, and serve to prevent the expulsion of the pelvic viscera. The muscles composing this pelvic floor may be divided into two layers, the upper one is composed of the *levator ani* and the *coccygæus*; the lower, of the *sphincter ani*, the *transversalis perinæi*, the *constrictor vaginæ* and the *erector clitoridis*. The septum, formed by the levatores ani, resembles a funnel (16, fig. 6) with three openings in it, for the passage of the rectum (13), of the vagina (14), and of the urethra (15). The superior surface of this muscle, which is seen in fig. 6, is concave, and is covered by the peritoneum and the pelvic fascia. On the perinæal surface of this muscle, which is convex, are placed the muscles forming the perinæum. This muscle arises in an uninterrupted line, extending from the symphysis pubis to the spine of the ischium, and its fibres are inserted into the neck of the bladder; into the sides of the vagina and rectum, and into a tendinous raphe, extending from the rectum to the coccyx, and into the coccyx. Its action is to elevate the parts to which it is attached, and to act as the antagonist of the diaphragm and of the abdominal muscles. The *coccygæus muscle* fills up the space left by the deficiency of the levatores ani posteriorly. It arises from the spine of the ischium, spreads out fan-like, in front of the sacro-sciatic ligaments, and is inserted into the sides of the last bones of the sacrum, and of all those of the coccyx.

In the female, the perineal muscles are: 1. The *sphincter ani*, which arises from the coccyx and passes round the lower portion of the rectum, to be inserted into the central point of the perineum. 2. The *sphincter* or *constrictor vaginæ* surrounds the anterior extremity of the vagina. It is about one inch and a quarter wide, arises from the body of the clitoris, and, passing round the vagina, it is inserted into the central point of the perineum. It acts as a sphincter to the anterior opening of the vagina. 3. The *erector clitoridis* arises from the ascending ramus of the ischium, and, covering the inferior face of the crus clitoridis, it passes forward to be inserted into the sides of the body. 4. The *transversalis perinæi* arises from the inner edge of the tuber ischii, and is inserted into the central point of the perinæum.

In addition to these muscles, the pudic nerves and blood-vessels, a mass of cellular and adipose tissue, the pelvic aponeuroses and the skin form a portion of the perinæal floor, which, in the natural state, is thick and firm, and fully capable of giving support to the pelvic viscera. During parturition, the perinæum becomes thin and distended, so as to permit the easy passage of the child.

CHAPTER II.

WE will divide the female organs of generation into those which are *external*; as the *mons veneris*, the *vulva* and the *perinæum*; and those which are *internal*, as the *vagina*, the *uterus*, the *ovaries* and the *fallopian tubes*.

SECTION I.—The *mons veneris* is a rounded prominence situated on the fore part of the pubis. It is composed of a mass of adipose matter, covered by skin, which is abundantly supplied with sebaceous follicles. The prominent rotundity of the *mons veneris* varies with the amount of fat deposited. In early life the *mons veneris* is smooth, but at the period of puberty it becomes covered with hair.

The *vulva* is a longitudinal fissure, extending from the symphysis pubis, along the median line, to within about an inch of the anus. On each side of the *fissura vulvæ* or the *genital fissure*, there are two oblong eminences, more prominent above than below, running from the *mons veneris* to the posterior part of the vulva. These eminences are called the *labia majora*, and their point of union anteriorly is called the *anterior commissure*, while that posteriorly is called the *posterior commissure of the vulva*. The *labia majora* or *externa* are composed *externally* of skin covered with hair and abundantly supplied with sebaceous follicles; *internally* of mucous membrane; and, between the two surfaces, there exists a greater or less quantity of adipose tissue, which gives to the labia their prominence. In the virgin state these labia lie closely, the one upon the other; but, where the female has borne children, they lose their prominence and become somewhat separated.

A little above the posterior commissure of the vulva, the labia majora are united by a delicate duplicature of membrane, called the *frænum* or *fourchette*. This part is usually slightly lacerated during first labours, but this occurrence occasions no trouble.

The *labia minora*, or *interna*, or *nymphæ*, are brought into view, by separating the labia majora. They are formed of cellular tissue,

contained within a duplicature of mucous membrane, and bear a resemblance to the comb of a cock. The *labia minora* do not extend the whole length of the genital fissure, but commencing about its middle, they run parallel with the greater labia, towards the clitoris, at which point they separate into two parts, the inferior of which becomes attached to the clitoris, while the superior lamina passes round this body, so as to form a prepuce or covering to it. In early life, as well as in females who have borne children, the *nymphæ* project beyond the external lips; at puberty, however, they are enclosed within the labia majora. It is said that the object in this duplicature of mucous membrane, is to allow for the amplification of the vulva during parturition. We have found them, however, in some cases of labour, entirely uneffaced.

The *clitoris* is a small red projection placed between the labia below the anterior commissure. It is attached to the rami of the pubis by two crura, which unite to form the body of the organ. Upon the extremity of this body there is a round red protuberance, called the *glans clitoridis*. The clitoris is composed internally of a spongy cellular tissue, resembling the corpus spongiosum in the male. Its length is very variable.

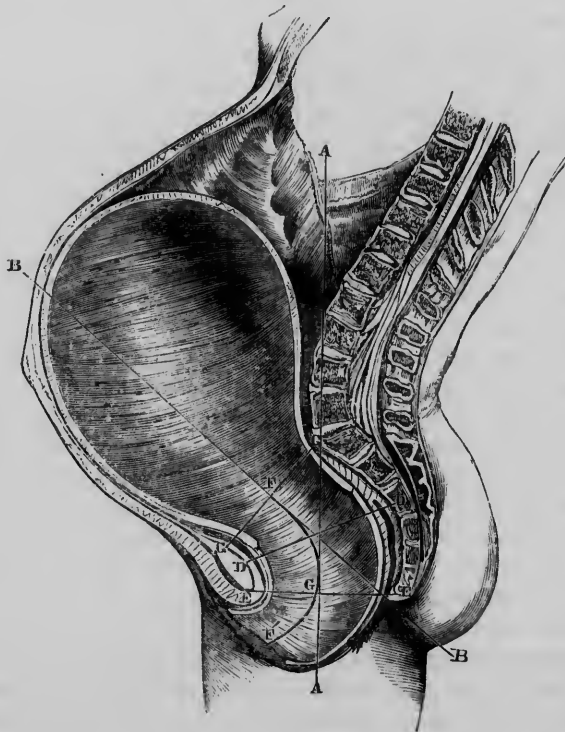
The *vestibulum* or *vestibule* is a triangular depression, about one inch long, bounded above by the clitoris, below by the urethra, and laterally by the nymphæ. It is abundantly supplied with mucous glands.

The *urethra* of the female opens a short distance below the clitoris. It is an inch long, more dilatable than that of the male, and passes immediately under the symphysis pubis, in a direction obliquely upward and backward. The *meatus urinarius* is composed of two membranes; one internal, or mucous, which is continuous with that of the bladder and the vagina; another, external, composed of condensed cellular tissue, bearing a strong resemblance to muscular fibre. The orifice of the urethra is more constricted than that of the upper portion of the canal. In those cases where we wish to introduce the catheter, the orifice of the urethra may be found by searching for a small tubercle surrounded by a fold of mucous membrane, and situated directly under the symphysis pubis.

The *vagina* is directly below the urethra, and, in the virgin state, it is partially closed in front by a fold of mucous membrane, called

the *hymen*. The shape of the hymen varies ; sometimes it is crescentic—at others circular with a foramen in its centre ; or it may be complete and imperforate. This membrane also presents differences as regards the firmness of its texture ; being in some cases exceedingly firm and resisting, in others thin and fragile. The existence of this membrane has been considered as a sure evidence of virginity, but there exist undoubted cases, to prove the falsity of this opinion. On the other hand, the nonexistence of this membrane must not be regarded as indicative of the loss of virginity, since its texture is

Fig. 7.



sometimes so fragile as to be easily ruptured by any violent movements of the body. When the hymen is ruptured, as it usually is

at the first sexual union, and often from other causes, there remains along the circumference of the orifice of the vagina from two to five small tubercles, called *carunculæ myrtiformes*. Some physiologists do not think that these bodies are relics of a ruptured hymen.

Between the posterior border of the vaginal orifice and the fourchette, there is a depression termed the *fossa navicularis*.

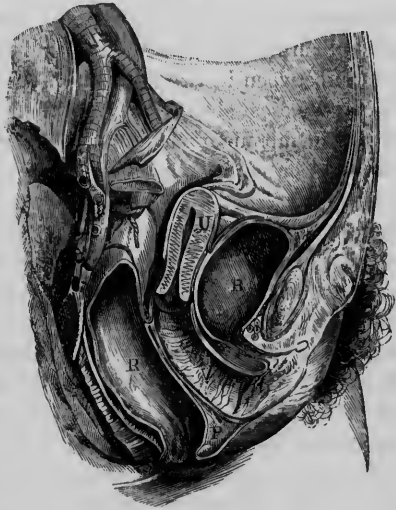
By the term *perinæum*, obstetricians mean all the space lying between the posterior commissure of the vulva and the anus. This perineal space measures about $1\frac{1}{2}$ inches, and is traversed along its mesial line by a prominent hard ridge, termed the *raphe of the perinæum*. The perinæum is composed externally of skin; internally of adipose and cellular tissue, of fascia, and of a portion of those muscles, which we have already demonstrated.

We remarked, when speaking of the curvature of the pelvic cavity, that it must not be considered as terminating at the point of the coccyx, but that the soft parts lying between the coccyx and the posterior commissure of the vulva, a distance of $2\frac{1}{2}$ inches, formed the continuation of the pelvic incurvation. By a reference to figure 7, it will be seen that the curvature extends much beyond the plane (EE) of the inferior strait, and that, as the child advances through the pelvis, it is contained in a canal formed by the vagina, and continuous with the expanded neck of the uterus; that this canal becomes gradually enlarged, so as to conform itself to the form and size of the pelvic cavity, and is continued as far forward as the pubic arch, a distance measuring, when the parts are distended during parturition, five or six inches. This is a point of great importance, since it is essential that the child should traverse not only the axis (FG) of the bony pelvis, but also the axis (GFF') of the curved canal, formed by the soft parts extending from the coccyx to the posterior commissure of the vulva. If due regard is not paid to this point, either in natural or artificial delivery, a laceration of the perineum will certainly occur.

SECTION II.—Before entering upon the description of the internal organs of generation, it will be necessary to glance at the relative position of these organs within the pelvic cavity. By reference to figure 8, which represents a vertical section of the natural pelvis, the bladder (B) is seen in front, with its meatus urinarius, passing out under the symphysis pubis. The anterior face of the bladder,

when distended, is placed against the posterior part of the symphysis pubis, and the walls of the abdomen; posteriorly it is in contact with the uterus (U) *above* and the vagina (V) *below*. The bladder and urethra are separated from the vagina by a strong septum, composed of cellular tissue. This close union of the uterus and vagina with the bladder, serves to retain the former organs *in situ naturali*, and even where prolapsus uteri occurs, it is almost always accompanied with some displacement of the bladder and urethra. The upper portion of the uterus is separated from the bladder by a reflection of peritoneum, which is represented in the figure by delicate white lines.

Fig. 8.



Behind the bladder, we observe a curved canal, called the vagina, united above to the uterus. Posteriorly the vagina lies against the rectum, being separated from it by a septum of cellular tissue, much less strong than that which binds the bladder and vagina together. The uterus does not touch the rectum, but is separated from it by a duplicature of the peritoneum. This serous membrane covers the fundus of the uterus. The rectum (R) is placed behind the vagina, and to the left of the median line of the sacrum. It is curved, so as to correspond with the hollow of the sacrum, and its position is such as to diminish the capacity of one of the oblique diameters of the superior strait. The vacant space (P) which lies between the rectum and vagina, is the perinæum.

The *vagina* is a canal, (curved, so as to correspond very nearly with the axis of the pelvic cavity,) which extends from the vulva to the uterus. This canal is from 4 to 6 inches long. Its length, however, varies according to circumstances; thus, during the first two

or three months of pregnancy, the vagina is shortened ; whereas, after the uterus has risen above the pelvic brim, its length is increased. Again, it is much longer in virgins, than in those who have borne children. The diameter of this canal measures about an inch, though it is capable of enormous distension. Its vulvar orifice is more contracted than its uterine extremity, and the capacity of the canal is greatest between its two extremities. The superior extremity of the vagina encloses about one-third of the cervix uteri, so that the mucous membrane of the former is reflected over the exterior of the latter, and becomes continuous with the membrane, which lines the interior of the uterus. The mode in which the vagina is inserted into the neck of the uterus is such, that a *cul-de-sac* is formed between the two ; so that in making an examination *per vaginam*, we are enabled to investigate the state of the whole circumference of the cervix. The cul-de-sac is rather deeper behind than before. The vagina is composed of a fibrous and mucous membrane ; the first is placed externally, and consists of condensed cellular tissue, highly elastic, and of a reddish colour. The internal or mucous lining, is a continuation of the mucous membrane of the vulva ; it is of a vermilion tinge inferiorly, but superiorly it has a grayish appearance. The anterior portion of the vagina is divided longitudinally by a slight elevation, termed the *anterior column of the vagina*, which commences at the vulva by a small tubercle, often confounded with the carunculæ myrtiformes. On the posterior part of the vagina there exists a similar elevation, though less distinct, called the *posterior column of the vagina*. The mucous membrane of the vagina is gathered into transverse folds, which are more distinct below than above. The object of this arrangement seems to be intended to allow for the *extension* which the vagina suffers, when the pregnant uterus rises above the pelvic brim.

The *corpus spongiosum vaginæ*, or the *plexus retiformis*, is an erectile tissue, resembling that of the corpus spongiosum urethræ, placed at the anterior end of the vagina, between the sphincter vagina and the fibrous tunic of the canal. It is an inch broad, a line or two thick, and serves to strengthen the lower extremity of the vagina.

The *uterus* is a hollow organ, intended to contain the fecundated ovum during the term of utero-gestation. This organ, pyriform in

shape, and resembling a small pear flattened anteriorly, is fixed obliquely in the pelvic cavity, so that its long diameter corresponds, very nearly, with the axis of the superior strait. The superior or large extremity of the uterus is convex, and looks upward and forward, while its inferior portion, which is embraced by the vagina, is directed backward towards the sacrum. The anterior face of the uterus is less convex than the posterior; its lower half rests against the posterior part of the bladder, but the upper portion, covered by a lamina of peritoneum, comes in contact with the small intestines. Posteriorly, the uterus is entirely covered by a peritoneal coat, and lies against the rectum.

From the work of Mad. Boivin, we take the following measurements of the uterus of a virgin female, twenty-five years old, and of the ordinary size :—

Whole length of the organ	- - - - -	26 lines.
Width of the fundus uteri	- - - - -	17 "
Thickness of the fundus	- - - - -	8½ "
Width of the cervix uteri	- - - - -	9½ "
Thickness of the cervix	- - - - -	7 "
Thickness of the uterine walls	{ superiorly	- - 5½ "
	{ laterally	- - 5 "
	{ posteriorly	- - 4 "
	{ anteriorly	- - 4 "
Thickness of the walls of the cervix	{ laterally	- - 3½ "
	{ posteriorly	- - 3 "
	{ anteriorly	- - 4 "
The whole weight of the uterus, without its appendages		- - - - - 5 drachms.

After a female has borne children, the dimensions of the uterus are considerably changed, and the following measurements, taken from the work of Mad. Boivin, will give an idea of the increase which previous pregnancy produces in the size of the uterus.

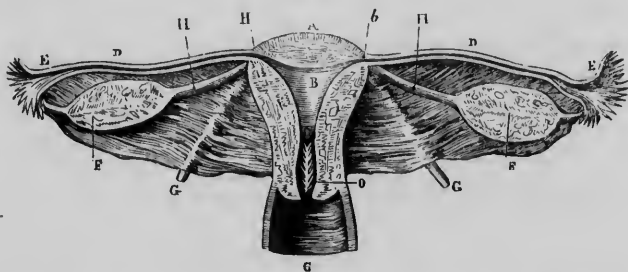
Whole length of the uterus	- - - -	from 2½ to 3 inches.
Length of the cervix uteri	- - - -	from 13 to 15 lines.
Length of the body	- - - -	about 2 inches.
Width of the cervix	- - - -	18 lines.
Thickness of the body of the uterus	- - -	14 "

Thickness of the cervix	- - - - -	10 lines.
Thickness of the walls of the body of the uterus	6	"
The weight of the uterus, without the appendages	- - - - -	from $1\frac{1}{2}$ to 2 oz.

Anatomists have divided the uterus into: 1. The *fundus uteri*, which comprises all that portion above the orifices of the fallopian tubes. 2. The *cervix uteri*, or neck, which includes the lower cylindrical portion. 3. The *corpus uteri*, or the body comprising the part intermediate to the fundus and cervix.

It is very essential for the student to understand accurately the form, size, and consistence of the cervix uteri. Externally the cervix is not separated by any distinct line from the body of the organ; but if the uterine cavity (B, fig. 9) be examined, it will be seen that

Fig. 9.



the triangular cavity of the body terminates below, at the point (C), in a narrow circular canal (O), which constitutes the cavity of the cervix. The neck of the uterus is pyramidal in shape, and its apex, which looks downward, is divided by a transverse fissure into an *anterior* and *posterior* lip. From this fissure, there is a small oval foramen leading to the cavity of the cervix, which is called the *os tincæ*, or *os uteri*, or *mouth of the uterus*. In the virgin uterus, the os uteri is nearly closed, but after the female has borne children, it remains patulous and large enough to admit the extremity of the finger. Besides this, the anterior and posterior lips of the os tincæ, which, previous to childbearing, are small and smooth, become after parturition large and irregular; the inequalities being caused by the laceration of the fibres during the passage of the child. In the virgin

condition the cervix uteri is smooth and firm, and of a reddish-pink colour; but during menstruation or pregnancy its tissue becomes swollen and soft, and the colour is changed to a deep red. Another effect of frequent parturition is to diminish gradually the length of the cervix. The cavity of the body (B, fig. 9) of the uterus is triangular, and at each angle of the triangle there is an orifice, the lower one (C) leading to the cavity of the cervix, the two upper (b) forming the entrance into the fallopian tubes. The cavity of the cervix uteri (O) is cylindrical, though it is somewhat wider in its middle than at its two extremities. The mucous membrane of the cervix is gathered into folds of a peculiar character, which give to it a rough appearance. The glands of Naboth, which are found under the mucous membrane of the neck, are nothing more than muciparous follicles, which, in disease of the parts, become enlarged, and feel like shot, when touched with the finger.

Structure of the Uterus.—1. Its peritoneal covering is reflected from the bladder over the upper half of the anterior face of the uterus—over its fundus—over its posterior face, and descends so low down as to cover the upper part of the posterior face of the vagina. The peritoneum does not adhere very closely to the uterus, along its lateral borders, but at every other point the connection between the two is quite firm, so that in detaching it, the membrane is very apt to be torn. 2. The proper tissue of the uterus,—the character of this tissue is not easily ascertained in the non-pregnant state. It is of a grayish colour, very firm and dense, crackling under an incision with the scalpel. The fibres of which this tissue is composed are generally admitted to be muscular, but the arrangement of these fibres, where pregnancy does not exist, is entirely inexplicable. 3. Internal membrane.—Though it was formerly doubted by many anatomists, whether the uterus was lined with a mucous membrane, yet the microscopic observations, which have been lately made, seem to have decided this question in the affirmative, and justify us in concluding that the mucous membrane of the vagina is continuous with that of the whole uterine cavity, and even with the fallopian tubes.

The uterus is abundantly supplied with blood, by blood-vessels which come from the hypogastric and spermatic arteries. These arteries anastomose freely, and ramify, in a tortuous manner, through

the walls of the uterus. The nerves of the uterus come from two distinct sources: 1, branches from the renal and hypogastric plexus, which supply the body of the organ: 2, branches from the sacral plexus, which are distributed to the cervix uteri.

The fact that the body of the uterus is principally supplied by nervous filaments from the great sympathetic nerve, explains how it is that most of the vital organs of the body, especially the brain and the stomach, sympathize so freely with the uterus, as well under disease, as during pregnancy. On the other hand, the cervix uteri is supplied chiefly with nervous filaments from the cerebro-spinal system of nerves, hence it is more sensitive to the touch than any other portion of the organ.

Developement of the Uterus.—In the embryo the uterus is said to be *bifid* in its form until the end of the third month, when the two portions become united. During fœtal life, the cervix uteri is longer than the body; but at puberty, the latter becomes much developed—in fact, at this period the whole generative apparatus has reached its perfect developement, and but little change occurs, until the procreative period has passed, when all the organs, composing the apparatus, become gradually atrophied.

Ligaments of the Uterus.—1. The broad ligaments:—The lamina of peritoneum which covers the anterior and posterior face of the uterus, become united laterally and pass outward to the sides of the pelvis, dividing this cavity into two portions; the anterior, containing the bladder,—the posterior, the rectum. Within the layers of the broad ligaments, the ovaries and its ligament, the fallopian tubes and the round ligaments, are contained: 2, the round ligaments, (G, fig. 9) composed of some of the uterine fibres, of cellular tissue, of blood-vessels, &c., arise from the anterior superior angle of the uterus, and pass upward and outward to the internal abdominal ring, through the inguinal canal, to be inserted into the cellular tissue of the mons veneris and of the labia majora. These ligaments certainly serve to steady the uterus in its position, but they are scarcely capable, as has been supposed by some, of preventing the displacements of this viscus. The insertion of the round ligament is such, however, as to prevent the retroversion of the fundus uteri into the hollow of the sacrum.

The fallopian tubes are two canals (DD, fig. 9), four inches long,

extending from the upper angles of the uterine cavity to the sides of the pelvis, and serving to transmit the semen from the uterus to the ovaries. The cavity of the uterine extremity of these tubes is exceedingly small, gradually enlarging, as we proceed outward, where it terminates in an expanded portion called the *pavilion* or *fimbriated extremity* (EE, fig. 9), which hangs loosely over the ovaries. The fallopian tubes are covered with a peritoneal layer (obtained from the broad ligament), which is continuous with the internal or mucous membrane lining the cavity of the fallopian canal. Intermediate between these two membranes, the tubes are composed of a cellulo-fibrous tissue, identical with the proper texture of the uterus. The fimbriated extremity of these tubes is said to be connected with the ovaries, by means of a special ligamentous band.

The *ovaries* (FF, fig. 9) are two oblong whitish bodies, one inch in length, and flattened in their antero-posterior direction. They are contained within the broad ligaments, and are attached to the uterus by the ligament (HH, fig. 9). The ovaries in the fœtus are proportionally larger than in the adult, and are, owing to the smallness of the pelvis, placed above the pelvic brim. After birth they diminish in size, and sink within the pelvic cavity; from which they rise, however, during pregnancy, as the uterus increases in size. At the period of puberty, they become enlarged, but again diminish in size, when the procreative period has passed. The surface of the ovaries is smooth until puberty, when it becomes rough and knotty, owing to the escape of the ova.

The covering which the ovaries receive from the peritoneum is called the *indusium*. After removing the *indusium*, we find the body of the ovary invested with a dense fibrous membrane, called the *tunica albuginea*. The proper parenchyma of the ovary consists of condensed cellular tissue, called the *stroma*, in the interstices of which are placed the Graafian vesicles or follicles, called by Barry *ovisacs*. These ovisacs are composed of two separate tunics; the *external* one, placed next to the stroma, is firm, fibrous, and vascular in its character, like the stroma; the *internal* tunic is neither so firm nor so thick, and is supposed by some to be destitute of vascularity, though this is denied by others. These two tunics are placed so close to each other, that it is sometimes difficult to separate them.

The internal face of the inner tunic is filled with a mass of granules, floating in an albuminoid fluid, and among these granules the ovum is imbedded.

The *ova* are placed in the ovisacs, and in the mammalia they are identical with the egg of the oviparous animal, except that they have neither the albuminoid fluid, constituting the white of the egg, nor the calcareous matter, constituting its shell. The ovarium, even in fœtal life, contains immature ova; at a later period, however, the number of these greatly increases.

We shall hereafter find that the developement of all those interesting functions peculiar to the female, when arrived at the age of puberty, is entirely dependent upon the existence of the ovaries in their healthy and normal condition. If these bodies be defective or diseased, the various signs of puberty will fail to be developed, and sterility will be the consequence.

CHAPTER III.

Menstruation.—The period of puberty in the female is announced by the enlargement of the mammæ, by the growth of hair upon the pubis, by the developement of the pelvis, and by the appearance of the *menstrual* or *catamenial* discharge. The process of menstruation is physiological in its character, and consists in a sanguineous discharge from the uterine system, beginning at puberty and renewing itself from time to time during the procreative period, unless interrupted either by disease, gestation or lactation. The function of menstruation is common to every race of man, and occurs, as we shall see hereafter, in some of the lower order of animals. The appearance of this discharge may be regarded as indicative of a full developement of the organs of generation; but, on the other hand, the non-appearance of the catamenia *does not imply* an inability on the part of the female to procreate the species, unless it be accompanied with an undeveloped condition of the ovaries, of the pelvis, of the mammæ, &c. It is well known, that if the ovaries be congenitally defective, none of the signs of puberty, to which we have alluded, will make their appearance; and farther, if they be removed, not only will the catamenial discharge cease, but there will be no return at regular periods of the ordinary symptoms of a monthly flow. When, on the contrary, the ovaries are healthy and well-developed, though the uterus be defective, there will occur, at each successive monthly period, symptoms of the menstrual erythism, without the discharge. Menstruation must be regarded as a phenomenon consequent upon or secondary to the full developement of the generative system, and closely connected with the periodic discharge of *ova*. In this view of the matter, the absence of the menses does not imply sterility, provided the other signs of puberty exist, whereas their presence is an external evidence of the fitness of the generative organs for the exercise of their important functions. The case recorded by Kleeman, together with other facts, would seem to

strengthen this point. He relates a case in which the menses never appeared until two months after the birth of the eighth child, from which time they continued to recur regularly until the 54th year.

The catamenia often make their appearance without any premonitory symptoms; they are, however, preceded most usually by colicky pains, a sense of weight and heat about the pelvis, headache, full pulse, &c. The discharge at first is small in quantity, and of a muco-serolent character, soon becoming abundant and bloody. After a few days the flow begins to decline, becoming less in quantity, and of a paler hue, until it finally ceases. When the catamenial flow has been fully established, all the premonitory symptoms disappear, to be followed by others indicative of great lassitude and debility, which in their turn give place to the establishment of the ordinary health of the individual, as soon as the discharge has ceased.

The period of life at which the catamenia first make their appearance is not the same in all countries. The observations of Drs. Guy, Roberton, &c., show, that in England and Scotland the greatest number of females begin to menstruate at 15 years of age, while some few menstruate as early as the 11th, and others as late as the 19th year. In France and Germany, nearly the same results have been arrived at. Dr. Roberton states that in Hindostan the catamenia make their first appearance between the 12th and 13th year. In the United States, most females begin to menstruate at the age of 14 or 16. These general rules in regard to the first appearance of the menses are modified by various causes. Thus, Raciborski says, that one degree difference in latitude makes a difference of one month in the appearance of this discharge; and that even in the same latitude a difference in temperature produces a similar result. Drs. Lee, Roberton, &c., have attempted to controvert these opinions, but we do not think their facts at all conclusive. Again, *education and mode of life* exercise a considerable influence, for we find that females living luxuriously and in large cities menstruate at an earlier period, than those who lead frugal lives in the country, though the temperature of the two places may be the same. Under all varieties of climate, *individuality of constitution* exercises its influence in accelerating or retarding the first appearance of the catamenia. Raciborski asserts that the same effect is produced by peculiarities

of race, even though a change of climate has taken place. Thus it is, that the Jews at Warsaw still retain their oriental constitution, and menstruate a few months earlier than the natives of their adopted country.

In every country curious cases of precocious and tardy menstruation have been recorded. Haller mentions one where the female menstruated at the ninth year. Others have been reported as occurring at some time between the first and seventh year. The most curious case is that recorded by Velpeau, in which a child from Havana began to menstruate regularly at eighteen months of age. In this case, Velpeau adds, that there was a developement of the other signs of puberty. In the fourth Vol. of the *Med. Chir. Trans.* of London, there is reported a case in which menstruation commenced regularly at birth. At the age of four years the child died, and upon examination the uterus was found unusually developed; the state of the ovaries unfortunately is not mentioned. In these cases of precocious menstruation, Raciborski thinks that the Graafian vesicles are fully developed, and that the catamenial flow is only the necessary consequence of the periodical maturation of the ova.

It is supposed by most writers that the early appearance of the menses hastens the period of their cessation; this fact, however, is denied by Frank. As a general rule, those who begin to menstruate very late in life, have their catamenial epochs less frequently than those commencing early, and with the former, the exercise of the function is more irregular, than with the latter.

The ordinary time of duration of a single catamenial period is about five days; this is modified, however, by many circumstances, as peculiarities of constitution, the health of the individual, moral emotions, cold, &c.

The quantity of blood discharged at each menstrual period varies very much with different persons; though, in an individual of good health, the quantity lost is nearly the same at all times. Hippocrates fixed the amount lost by the females in Greece at eighteen ounces; this is more than double the amount lost by females in more temperate climates. Haller says it varies from six to twelve ounces; Baudelocque from three to four, and Lee and others from three to six. In our country, Dr. Dewees estimates the amount lost at each menstruation, at from four to six ounces.

Women who begin to menstruate very early, are said to lose less,

than those with whom the function commences at its usual period. High temperature, luxurious and exciting modes of life, induce a greater loss of menstrual blood, than where the opposite condition of things exists. Moreau mentions a singular fact, viz.: that females removing from the interior of France to the city of Paris, not only lose less blood at each menstrual period, but that the recurrence of the discharge is less frequent.

When the catamenia are once established, they recur in most cases every twenty-eight days, unless interrupted by disease, lactation or gestation. Some females naturally menstruate less frequently and less regularly than others, and in some cases the function continues during lactation and gestation.

The function of menstruation usually ceases between the forty-fifth and fiftieth year, so that the procreative period of a female, which is the period during which she menstruates, continues during thirty years. In some cases the function ceases early in life, or it may be continued to a very advanced age.

What is the nature of this discharge? Some have maintained that menstruation consists simply in an exhalation of blood from the uterine blood-vessels; others insist that it is the result of a secretory process and differs materially from pure blood. Without entering into a discussion of this question, we may state that the menstrual fluid resembles pure blood; but that it contains less fibrine, and will not, under ordinary circumstances, coagulate.*

Does the menstrual fluid proceed from the uterus or not? This is a subject which has given rise to considerable discussion. Facts, however, of an undoubted character, prove that the discharge proceeds from the uterus. 1. In dissections of the uterus of females, dying during the menstrual period, the interior of that organ is found covered over with bloody spots, and the blood could be pressed out of its walls. 2. In prolapsus uteri, the fluid is seen running from the mouth of the uterus. 3. If the uterus be examined with the speculum, during the catamenial period, the blood is seen trickling through the os uteri. 4. As soon as the uterine cavity is occupied by the product of conception, menstruation ceases. But how are

* Bouchardat and Denis have attempted to prove that the menstrual blood only differs from arterial blood in being mixed with mucus; and Mande asserts that the smallest quantity of mucus or pus, mixed with blood, will prevent its coagulation.

we to explain those cases, in which the catamenia continue during pregnancy? In this case, the discharge proceeds from the unexpanded portion of the cervix uteri; or it may be that the vagina takes on a supplemental action, similar in character to the vicarious discharges, with which we sometimes meet; thus Moreau mentions a case in which the menstrual flow was substituted by a discharge from the mammæ.

The cause of this periodical discharge is involved in great doubt. Some have attributed menstruation to lunar influence, but we know of no facts which would warrant the adoption of such a notion. Others have referred it to the existence of local or general plethora. That the uterus, during the catamenial flow, is congested, is a fact which no one doubts, but why this congestion should occur every 28th day is a point utterly inexplicable, even at the present day.

As connected with this subject, we will refer, in a general way, to the results deduced from the interesting experiments of Bischoff, Pouchet, Raciborski, &c. 1. In animals, a discharge from the organs of generation takes place at stated periods, which bears a strong analogy to the catamenia in women. 2. In animals this supposed catamenial period is always coincident with "heat," or "rutting." 3. If, during this discharge, the ovaries of animals be examined, it will be found that the ova mature and are thrown off into the fallopian tubes, entirely independent of sexual intercourse. 4. In women, who have died during, or near, the menstrual period, the ovaries are found congested, and there exists small excavations within them, from which the matured ova have been discharged, as in animals, entirely independent of coitus.

At present we will only notice one point connected with this subject, viz.: the identity between the period of heat in animals, and the menstrual epoch in the human species. The analogy between these two periods may be admitted (at least for the present), so far as it regards the maturation of the *ova*, and the periodical discharge of blood from the genital organs—but to say that, during the menstrual epoch, the human female labours under the *ardor venereus* more than at any other time, is unsupported by fact. Indeed, it is at this time that a female seems least disposed to sexual intercourse; but, the advocates of this new notion say, that this indisposition arises from a sense of delicacy and cleanliness. This very proper feeling might operate in some cases, but we imagine that, with some fe-

males, utterly regardless of such sentiments, it would weigh but little, if they laboured under a venereal ardour equal, in intensity, with that which marks the brute creation. But again, it is asserted by Muller, Burdach and Dunglison, that this greater desire for sexual intercourse does not exist during the catamenial flow. Dr. Dunglison says that "It would be strange, however, if the period of the greatest aptitude for conception, should be one at which there is, and always has been, a repugnance to sexual union on the part of both sexes."

But it is argued, by these recent observers, that the laws which govern the animal creation are invariable. That they are so, to a certain extent, is true, but they are frequently wisely modified to suit each species, and the least reflection will convince us, that the greatest inconveniences would result from the extension of the law which governs brutes to the human species; while, on the other hand, it would be equally inconvenient to govern the brute creation, by such laws, as we consider only applicable to the social and refined condition for which man is intended.

From the foregoing facts we may deduce the following, as partly explanatory of the function of menstruation. By a peculiar organism the uterine system becomes, at stated periods, the seat of a certain aphrodisiac excitement, and in consequence of this excitement, or irritation, a congestion of the uterus, &c., takes place; which, after a longer, or shorter interval, is relieved by the free exhalation of blood from the interior of the uterus, constituting the menstrual or catamenial flow. It is asserted by Bischoff, Raciborski and others, that this menstrual period (the periodicity of which is inexplicable,) is always accompanied by the maturation and discharge of *ova* from the ovaries, independent of coitus, and that the catamenial flow should be regarded only as an accidental phenomenon in this function, the object of which is the preparation of the different ovules, in the ovaries, for fecundation. Ritchie, however, who is an industrious and sagacious observer, maintains that this maturation and discharge of *ova* goes on even during the intermenstrual period, but that it is probably more active at the menstrual epoch, than at any other time. This difference of opinion has given rise to an animated discussion, (which we will notice in our chapter upon generation,) as to whether fecundation is possible at any other time, than within a certain number of days, before and after the occurrence of the catamenia.

CHAPTER IV.

GENERATION.—The function of reproduction, belonging exclusively to organized beings, is that on which the existence and perpetuation of all organization depend. In the inorganic kingdom, when a new substance is formed, it is simply by an aggregation of minute particles of matter in a new form, at the expense or destruction of some body, into the composition of which these particles previously entered. In organic bodies the process is entirely different, and *being* after *being* is produced without impairing, in the slightest degree, the physical form or vital forces of the individual whence this new organization has proceeded.

Originally, physiologists maintained the existence of two modes in which generation was effected: 1, *regular* or *univocal*: 2, *spontaneous* or *equivocal*. The difficulty, before the discovery of the microscope, of detecting the minute structure of plants and animals, lead to the establishment of the latter theory, and it was maintained with great warmth, by many physiologists of olden times, and even at the present day, there are some who believe in the truth of the doctrine, at least as it regards the origin of intestinal worms, &c. The mode in which generation is accomplished in the animal creation is so various, as to have given rise to the following division:

1. *Oviparous* generation: where the *ovum*, once fecundated, is expelled by the female and hatched out of the body—this is the case with birds.

2. *Viviparous* generation: in which case the *ovum* is fecundated and conveyed to a reservoir, or womb, to be there nourished till a certain period, when it is expelled, having acquired *in utero* its appropriate form, size, &c. This is the way in which reproduction is accomplished in man and in most of the quadrupeds.

3. *Ovo-viviparous* generation: where the fecundated *ovum* passes out of the natural passages so slowly as to be hatched in the interior, and expelled in the live state—this is the case with the scorpion, &c.

This is the division which has been adopted when copulation was necessary ; in some animals, however, no copulation takes place, and the egg or ovum laid by the female is fecundated out of the body, by the application of the fluid of the male ; this is the case in the frog, fish, &c., &c. Other varieties might be mentioned, but as this subject belongs properly to the naturalist, we will pass to those points, which more immediately concern the mode, in which reproduction is effected in the human being.

In the human species reproduction requires the concurrence of both male and female, and may be divided into four distinct acts : 1, *Copulation* ; 2, *Conception*, or *Fecundation* ; 3, *Gestation* ; 4, *Parturition*.

By the term copulation, we mean the sexual union or coitus which takes place between the male and female, under the influence of certain instinctive passions, existing in every being.

The word conception, or fecundation, implies the vivification of the ovum, when a prolific copulation has taken place between the two sexes. Of gestation and parturition we will speak hereafter ; at present, we must examine the mode in which fecundation is accomplished.

The first point of dispute among physiologists is, what part does the male or female perform in this function ? It is a well-known fact, that after the removal of the testicles, the individual is incapable of procreating his species ; hence this spermatic fluid must be regarded as the active ingredient, to the exclusion of the fluids coming from the vesiculæ seminales, prostate gland, &c., &c.

Spallanzani observed that when the female frog laid the egg, the male immediately threw upon it a fluid, which soon produced its fecundation. By enclosing the genitalia of the male frog in a bag of taffeta, he found that fecundation was prevented ; but by collecting the semen, and applying it to some of the freshly laid *ova*, he found that fecundation took place. A similar experiment was made on a bitch in heat. By the injection of nineteen grains of semen into the vagina, at 100° Fahr., conception took place, and at the end of the usual period of utero-gestation, the bitch brought forth three pups, which resembled her and the dog, from which the sperm was taken. In this case it is certain that no copulation had taken place, since the animal was shut up twenty-three days before "heat" com-

menced. John Hunter mentions the success of a similar experiment on the human species. He recommended a person, affected with hypospadias, to inject his semen, by means of a warm syringe, into the vagina of his wife. She afterwards became pregnant.*

Prevost and Dumas expressed the spermatic fluid from the testicle of a frog, and diluting it with water, they immersed some *ova* into it, and found that they were fecundated. They also assert that in order to succeed in these experiments, it was necessary to dilute the semen.

These experiments proved conclusively that the *ova* furnished by the female and the spermatic fluid of the male, were the active ingredients in the accomplishment of conception. But some physiologists maintained that fecundation resulted, not from the actual contact of these two ingredients, but from the influence of the spermatic vapour (*halitus*, or *aura seminalis*) upon the *ova*. Had this been proved, the difficulty in regard to the mode in which the spermatic fluid reaches the *ova*, in man and other animals, would have been explained. Spallanzani, however, made the following experiment: he placed in a watch-glass some fresh *ova*, and in another some semen, and fitting the one closely upon the other, he waited to see the result. No effect was produced until the *ova* were touched with some semen, when their vivification took place. A similar experiment was made by Prevost and Dumas, with the same result.

These points being definitively settled, it next became a subject of enquiry as to the manner in which the semen is conducted to the ovaries. Prevost and Dumas maintained that fecundation took place in the uterus, because they were never able to detect the semen farther than the cornua of the uterus. Their negative evidence in this matter ought not to weigh against the positive assertion of Adelon, Spallanzani, Bischoff and others, who found it, not only in the fallopian tubes, but on the surface of the ovaries. Besides this, cases of ovarian and tubar pregnancy prove that fecundation does take place beyond the cornua of the uterus. Recent observations

* This experiment is recorded by Sir Everard Home, in his *Lectures on Comparative Anatomy*, vol. iii. p. 315. It is also mentioned in Duglison's *Human Physiology*.

have proved that the spermatic fluid may progress as far as the ovary, though it does not always do so; for it will be seen hereafter that the matured *ovum* progresses some distance into the fallopian tube, before it reaches the semen. It is, at present, impossible to explain, how the semen is carried to the ovary, or even as far as the fallopian tubes, since the propelling power of the penis is not sufficient to throw it farther than the uterus, and in some animals not even so far. John Hunter, Haller, and Blumenbach, found it in the uterus of animals, killed directly after emission, but how it progresses farther is still a mystery. Haighton supposed it acted upon the ova by sympathy, but of this there is no proof. We must take the facts as they exist, and look for the explanation afterwards. What is the nature of the material furnished by the female? Fabricius examined hens after they had been trodden, and observed in the ovaries small spots, in which blood-vessels were developed. From these the *ova* escaped, and, while passing through the oviduct, they became covered with a calcareous matter. Harvey observed the same thing in the doe, and he affirms positively that the ovaries contain *ova*.

De Graaf made experiments on rabbits, after copulation:—in six hours, the membrane covering the ovarian vesicles became reddish; at the end of 24 hours, a number of vesicles became opaque and red; and in two days they were found in the oviduct, and finally passed into the uterus. Malpighi also observed, that after copulation a body is developed on the ovary, which bursts and allows the escape of the ovum. Haller made similar observations; and he called the yellow body, remaining after the rupture of the vesicle, which was composed of the coverings of the ovum, *corpus luteum*.

The *ovum*, contained in the ovary, was considered by some to contain a fluid similar to the semen of the male,—by others it was said to consist of an organic molecule,—but physiologists of the present day regard it as an egg capable of vivification when brought in contact with the semen.

The time taken by the vivified *ovum* in traversing the fallopian tubes, varies in different animals. In rabbits, it is accomplished by the third or fourth day after copulation; in the dog by the fifth or sixth day; and in the human female by the eighth day; as the following observation of Sir E. Hume would seem to show:—In a

female who died on the seventh or eighth day after impregnation, the uterus was found much larger than in the virgin state; one of the ovaries presented a large cleft on its surface, from which the *ovum* had been discharged: the cavity of the uterus was covered with a coagulable lymph, within the folds of which was concealed a small spherical body, representing the fecundated *ovum*, which had reached the uterus by the eighth day.

It was found by Prevost and Dumas that some of the ova ripen sooner than others: thus, in the frog, the *ova* were seen in different stages of developement; and the same thing occurs in birds, though copulation has never taken place. This fact adds much weight to the modern doctrine, which maintains that the maturation and discharge of *ova* take place independent of coitus. If this be true in regard to birds, does not analogy require that the same is true with viviparous animals? and if so does the existence of corpora lutea indicate previous impregnation? This important subject will be discussed hereafter; and we will now only say, that while Haller, Haighton, &c., assert positively that the corpora lutea do present "incontestible proofs" of previous impregnation, Sir E. Hume, Blumenbach, Cuvier, Bischoff, &c., &c., have attempted to prove the error of their opinions.

Thus far it has been proved that the female furnishes the *ovum*, or *germ* of the new being; while the spermatic fluid of the male serves to vivify or fecundate, provided actual contact takes place between the two substances. But how does this admixture take place, so as to develop a new being, of the definite form and size peculiar to the species? How is it that this being is impressed in its physical, moral, and intellectual organization, with traits closely resembling one or both parents? These points are, in the present state of medical science, inexplicable.

The various opinions entertained on this subject, may be referred to one or the other of the two following doctrines: 1, that of *epigenesis*; 2, that of *evolution*.

By the doctrine of *epigenesis*, which is the most ancient of all, it was maintained that the new being was the result of the union of two materials, one emanating from the testicle, the other from the uterus or ovaries, during the act of copulation. Of this doctrine there are many modifications. Hippocrates thought the female

furnished a material substance, destined for the growth of the fœtus, and that the male fluid constituted the living principle, which was infused into this material furnished by the female. Aristotle and Galen considered that the menstrual blood was the fluid furnished by the female. Others asserted that the female and male both furnished a fluid, by the union of which the new being was generated.

The doctrine of *epigenesis* was maintained under some form or other till the beginning of the sixteenth century, when the discoveries of De Graaf, Harvey, Leewenhoeck, &c., gave rise to the new theory of *evolution*, according to which it was supposed that the new being pre-existed in some shape in one or the other of the sexes, which was vivified by the fluid of the other. This doctrine originated principally with Harvey, who, observing that there existed in the ovaria a number of small vesicles, which seemed to diminish in number in proportion to the frequency of impregnation, concluded that these vesicles were the germs of the new being, which required the vivifying influence of the spermatic fluid. This view in regard to the anatomy of the ovaries was confirmed by De Graaf and others. The objection to this theory of the ovarists (as they were called) is, that it is too exclusive, too little importance being ascribed to the part performed by the male fluid. If the semen only serves to vivify the ovules furnished by the female, how are we to account for the resemblance to the male parent ?

These objections to the theory of Harvey gave rise to a new set of opinions, based upon the researches of Leewenhoeck and others, who found the spermatic fluid to consist of innumerable animalcules ; that during copulation these were injected into the uterus, all dying but one or two generally ; and that they passed through the fallopian tubes to the ovaries, to be lodged in a nidus formed by the *ovum*. As the embryo increased in size, it burst its enveloping nidus, and passed again into the uterus, to be nourished during the term of utero-gestation. Such was the opinion of the animalculists, or spermatists, as they were called, in contradistinction to the ovarists, by whom it was contended that the embryo is the work of the male, the female only furnishing the nidus for its nutrition. The same objections might be urged against this theory that were alluded to when commenting on that of the ovarists.

The theory of evolution, in one form or other, was universally

accredited till the early part of the 17th century, when it gave way to the ingenious and fanciful notion of Buffon, which in fact was nothing more than the revival of the epigenetic doctrine. Buffon asserted that in both sexes there existed organic molecules, which in early life, previous to puberty, served the purpose of growth and nutrition; that when the growth of the individual was completed, a smaller portion of these molecules being required, the excess was thrown off by the generative organs for the perpetuation of the species. The ovaries were considered by him as female testes, which emitted organic molecules similar to those found in the spermatie fluid. By the union of these two sets of "*molécules organiques*" the new being is developed. Each molecule was supposed to contain a number of atoms proceeding from different parts of the body of the individual, and the resemblance to either parent was accounted for by the supposition, that when the male furnished most molecules, the likeness to the father would be greatest, and vice versa. Independent of the fact that there is no positive evidence of the existence of these organic molecules, the least reflection will show the untenable character of the views of Buffon.

Thus far we have reviewed in a hasty manner the views of the older physiologists upon the subject of generation, and it is now necessary to call attention to the recent investigations which have been made upon this interesting subject.

In our remarks upon menstruation, we asserted that the menstrual discharge had been observed in the lower order of animals, as well as in the human species. As the establishment of this fact is of the utmost importance to a proper comprehension of the phenomena of reproduction, we will take some pains to lay before the student most of the experiments upon which this assertion is based.

Aristotle asserted that, in some of the viviparous animals, menstruation occurred at stated periods, and ceased during conception. The same opinion was maintained by Buffon and F. Cuvier; and the latter relates a case in which a male and female of the quadrumanous species of animal were confined in a cage; during the whole of this time, the male exhibited the greatest desire for sexual intercourse; this was not observed in the female, who resisted every effort at copulation, until the appearance of a sanguinolent discharge from the vagina, when she not only gave evidence of being in heat,

but actually permitted copulation. The discharge in this case continued a few days, and recurred every 20th or 30th day. Mekel also observed this discharge in the monkey; and Buffon states its existence in the mare, the hog and buffalo. By Cable it was observed in the cow, coincident with the rutting period. In 1838, Newman asserted that it occurred in the cow, hog and sheep; in the cow, he says, it continued two or three days, and recurred every 20th day, except during gestation or lactation. The amount of fluid discharged from the cow reached two or three ounces, and it was proved to proceed from the uterus by the examination of that organ, in a cow, which died during the menstrual period.

Such are the opinions of the earlier physiologists on this interesting subject, and we must now examine the more recent investigations of Bischoff, Pouchet, Raciborski, Negrier, Lee and Ritchie. Pouchet considers the phenomena of generation identical in all animals, (though Duvernay and Bischoff only extend the parallel to the invertebrata,) and, according to him, they consist in an *ovule* or *egg*, furnished by the female, and in a spermatic fluid furnished by the male. These *ovules* are discharged at stated periods, and to be vivified they require the contact of the semen, without which they are discharged and perish. The contact of the *ova* and *semen* takes place, according to Bischoff at least, either in the ovaries, or the oviducts, or the uterus. In some animals the union takes place out of the body, as in fishes and frogs, and in these cases it is probable the *ova* were imperfectly developed when discharged from the ovary. The *ova* of viviparous animals, from their minute size, were at first overlooked, but more accurate observations with the microscope prove them to be identical with those of oviparous animals; and it may now be regarded as a fixed law, that *ova* are invariably found in the *ovarium* or egg-bearing organ.

By the experiments of Bischoff, &c., it has been attempted to prove the following points: 1. That the escape of the *ova*, from the *ovaria* of the mammiferæ, and of the human female, does not depend on sexual intercourse, or on the influence of the semen, but on their own independent and periodic developement. To prove this, Bischoff says: "It was necessary to follow the *ova* in their different phases of developement; to observe the rupture of the Graafian follicle; to detect the *ova* in the oviducts, in cases where sexual inter-

course had not previously taken place." 2. That the periodical maturation of *ova* is the first and most essential condition of conception and pregnancy, and at this time alone will coitus be followed by conception; at all others it will be impossible.

But what are the facts upon which the first law of Bischoff, is based? He supposed at first, that the *ova* were thrown off during sexual intercourse; and he was engaged in experiments, to prove the precise time at which this took place. The experiments of Blundell, Cruikshank, &c., which consisted in interrupting the connection between the ovary and the uterus, were repeated by him, and he became fully satisfied that the *ova* mature; the *Graafian vesicles* become turgid and burst; *corpora lutea* are formed, and the *ova* pass into the oviduct, entirely independent of the presence of the spermatic fluid.

But farther proof was needed, and for this purpose, the following experiments were made by Bischoff.

1. He took a young and healthy virgin bitch, and permitted her to be lined several days after the commencement of "heat." Immediately after coitus, the left horn of the uterus, together with the fallopian tube and ovary of the same side were removed, and upon examining them with the microscope, the semen was found in the corner of the uterus, but none had as yet entered the fallopian tube; still the ovary presented freshly ruptured Graafian vesicles, and distinct corpora lutea; besides this, five *ova* were found in the oviduct. In 24 hours the bitch was killed, for he thought from previous experiments, that the semen had had time to reach the ovary; the ovary of the right side also presented broken Graafian vesicles, with five distinct corpora lutea, and at about the middle of the fallopian tube, five *ova* were found not impregnated, for the semen had only, as yet, advanced three lines within the oviduct. The movements of the spermatozoa still seemed active.

It would appear from this experiment, that the lapse of time between the escape of matured *ova* from the ovary, and their impregnation was various, since in other cases, the semen in the dog was found to have advanced as far as the ovary in 18 hours, though at this time none of the Graafian follicles were ruptured.

2. He took a lamb, in heat for the first time, and 24 hours after, it was killed; and in the right ovary a Graafian vesicle had burst,

and an ovum was found, after careful search with the microscope, within the fallopian tube. In this case, there had been no copulation.

3. He took a bitch in heat; watched her closely till she seemed disposed to admit the dog; which, however, was prevented. Two days afterwards, the left ovary and fallopian tube were removed. No Graafian vesicles were broken, though four were found very turgid and red. Five days after this, the bitch was killed, and upon the ovary of the right side were discoverable four corpora lutea, *and in the oviduct of the same side, four ova* were found.

The same observations were made by Bischoff on the sow and rat, with similar result.

Though no experiments could more clearly show that the maturation of *ova* and their subsequent escape from the ovary take place independent of sexual intercourse, yet it will be necessary to refer to the following observations of Raciborski on this subject. On the sow he watched the progress of the maturation and escape of ova during the rutting period, and he found that the first change, which occurred in the Graafian vesicle on the approach of puberty, consisted in a considerable increase in the size of those lying nearest the surface of the ovary; the investing membrane of the follicle is thickened and less transparent. When the period of heat arrives, these follicles become congested; the vesicle bursts and the *ovum* is discharged. The follicle then contracts in size, and falling in folds upon itself, gives rise to the peculiar stellated appearance observed in cutting into a *corpus luteum*. These Graafian follicles exist, early in life, in the ovary, and during the whole procreative period they present various degrees of developement.

The following is an abstract, taken from the Medico-Chirurgical Review, of the views of Pouchet upon this subject: "In animals, the ova are discharged at determinate epochs, which are manifest with the periodic excitement of the genital organs. It has never been disputed, that in birds, reptiles, and fish, and in the *invertebrata*, there is a regular and determinate formation of *ova*; and even in the case of the *mammifera*, although the functions of the ovaries were not well understood, it was notorious that reproduction generally took place at regular and fixed periods. With respect, however, to them and to birds, it should be borne in mind, that fecundation may be repeated much more frequently, when the animals

are living in a state of domesticity, than in their natural condition. But we are not to infer from this circumstance that there is a continuous and uninterrupted action in the ovaries. The best laying hen rests during cold weather, and often we find, in the case of our domestic animals, that when we force them as it were to copulation, at unseasonable periods, the act is unfruitful, because it takes place when they are not naturally in heat. It is quite a mistake to suppose that the season has nothing to do with the process of reproduction, even in the case of those animals which from living in a state of domesticity are so much more frequently 'rutting,' than when they are in a state of nature. We may therefore assert that in all animals without exception, the escape of *ova* from the ovaries takes place. The period at which this escape occurs in the mammiferæ is indicated by turgescence and excitation of the genital organs; in some there is a sanguineous discharge from the vagina at the same time. Now the same holds good in the human species; the female is subject to phases of excitation and phases of intermission, and it is only during the first that the *ova* are produced, and that fecundation is possible. If the periods, when reproduction is possible, are very frequent in the case of women, this is manifestly due to the comforts of social life. But even with her we may follow the traces of these intermittent periods, and determine the epochs of their return with precision, just as we can do in the zoological series. In mammiferous animals fecundation never takes place, except when the emission of the *ovules* coincides with the presence of the seminal fluids; in other words, impregnation can only occur when the *ovum*, divested of the coverings it had in the *ovarium*, is carried forward, free, into the genital passages, and is there exposed to the action of the vivifying fluid."

Having, by the experiments of Bischoff and Raciborski, proved the periodic discharge of the *ova*, entirely independent of sexual intercourse, in many of the mammalia, it might be inferred from analogy that the same was the case in the human being; but theories, at the present day, can only stand when based upon incontrovertible facts, hence these laborious investigators deemed it necessary to prove, if possible, that the same law was applicable to the human species.

Bischoff examined four women who were drowned, though in

good health at the time of the accident, and in all of these females there existed strong evidence of menstruation at their death ; in three of them, a Graafian vesicle was found ruptured and filled, as is usual, with coagulated blood ; in the fourth female a large Graafian follicle was found much swollen. Dr. Ecker of Heidelberg found a Graafian vesicle ruptured in a girl who died at the age of twenty-five, about twelve days after the catamenial period had passed by. Raciborski has reported two interesting cases of this kind : 1. That of a healthy, well-formed virgin, aged twenty-six years, who had her catamenial flow on the 30th of August, 1842 : on the 10th of September following, she was attacked with dysentery, and died on the 30th of September, 1842 ; viz., thirty days after the catamenia. After death the hymen was found perfect ; the right ovary was larger than the left, and presented a mammillated vesicle on its anterior face, which was covered externally with some vascular ramifications. A beautiful net-work of vessels was observed on its internal membrane. On the posterior face of the same ovary, was observed a cicatrix, corresponding with an excavation as large as a cherry-stone, and lined by a membrane evidently folded and festooned at its edges ; this cavity was filled with a clot of blood. It is hardly necessary to add, that the excavation first described was the remains of a previous maturation, while the swollen vesicle on the anterior face of the ovary, with its net-work of blood-vessels, marked the preparatory process for a future maturation.

2. A girl aged nineteen years, of a good constitution, was attacked with scarlatina twenty-six days after the regular menstrual discharge. On examination after death, the two ovaries were found of different sizes ; the left being the largest. On this ovary a protuberance was found, with a bright red spot in the centre, and surrounded by an areolar of a less red colour, which gradually lost itself in the stroma of the ovary. By making a crucial incision into this protuberance, a cavity was displayed, filled with granular matter of a reddish hue ; this was without doubt the preparation for the next maturative period. The right ovary showed some traces of old cicatrices, and some vesicles about the size of a pea. The observations of Lee, Negrier, &c., which were made before those of Bischoff and Raciborski, prove beyond doubt, that during the menstrual period the *ova* mature, and are discharged from the ovaries. For a full

account of Dr. Lee's investigations, we would refer to his work on Midwifery. We may then consider it proved, that menstruation exists in many of the lower order of animals, as well as in man, and that about this catamenial period, there is a maturation and discharge of *ova*, entirely independent of sexual intercourse. Dr. Ritchie, however, differs with Bischoff, Raciborski, Pouchet, &c., in some of these opinions; thus, he supposes that the discharge of *ova* is not exclusively confined to the menstrual period, but frequently occurs at periods more or less remote from the catamenial flow. If this be true, then the opinion that a female can only be impregnated immediately after a catamenial epoch is not well-founded. Dr. Ritchie also maintains that menstruation may occur without the formation of corpora lutea, and consequently without the discharge of *ova*, because, every catamenial period is not necessarily preceded by, or accompanied with, the rupture of a vesicle.

The next law attempted to be proved by Bischoff is this:—"During the years in which a woman is susceptible of impregnation, an *ovum* ripens, and is separated from the ovary *every four weeks*, this phenomenon being accompanied by simultaneous hemorrhage from the uterus. This periodical maturation of an *ovum* is the first and most essential condition of conception and pregnancy. *At this time alone will coitus be followed by conception*; at all others this last will be impossible." It has been often asserted that women are more apt to conceive soon after the menstrual flow than at any other period. Nægèle says he has never found the calculation of nine months and eight days from the last menstrual period fail in fixing the term of utero-gestation. Raciborski says, that but few women become impregnated at a time remote from the menstrual flux; and he adds, that "of 15 women who specified accurately the period of their latest menstruation, as well as the dates of the connubial act, 5 evidently conceived from coitus taking place from 2 to 4 days previous to the period at which the catamenia was due. In 7, conception dated from coitus occurring 2 or 3 days after menstruation; in 2, it took place at the actual period of the catamenia; and in 1 only, so long as 10 days after the latter had disappeared." Bischoff thinks that from 8 to 12 days will comprehend the susceptible period of women; and Raciborski supposes that by abstaining from sexual intercourse for 3 days before and 8 days after the menses,

the chances of impregnation will be greatly diminished. The period of time previous to menstruation, at which a female may become impregnated, would seem, from the relation of the following case by Dewees, to be longer than is supposed by the authors whose opinions we have cited. Dewees relates the case as follows:—"The husband of a lady, who was obliged to absent himself many months, in consequence of the embarrassment of his affairs, returned one night clandestinely; his visit being only known to his wife, her mother and myself. The consequence of this visit was the impregnation of his wife. The lady was at this time within a week of her menstrual period; and as this did not fail to take place, she was led to hope she had not suffered by the visit of her husband. But her catamenia not appearing at the next period gave rise to a fear that she had not escaped; and the birth of the child 9 months and 13 days from the time of this clandestine visit, proved her apprehensions too well founded." From these facts it would seem proved that a woman is most susceptible to impregnation, *about the time of the menstrual flow*. But it does not follow that this is the only period during which impregnation is possible, since Ritchie asserts that as the discharge of ova is continually taking place, impregnation may occur even during the intermenstrual period. This view is rendered more probable, by the admission on the part of Pouchet and Raciborski, that sexual intercourse may hasten the maturation of the ova, by stimulating the ovaries to a more rapid maturation of their products, and rendering them sooner adapted for separation. Again, this maturation and separation of ova is a vital process, the activity of which may be retarded by a variety of causes, so that even when it commences at the menstrual epoch, the progress in the maturation and separation may be so slow and sluggish, as not to reach its perfection until a much longer period after the cessation of the menstrual flow, than is usually supposed. This is one of the points in the new theory of generation which requires farther corroboration; for though analogy would induce the belief that a female could only be impregnated about the menstrual period, yet the facts, brought in support of this point, are far from being satisfactory or conclusive. Hence, we feel disposed to adopt the opinions of the editor of the *Gazette des Hôpitaux*, where he says—"Considered with respect to her generative functions, woman holds a place intermediate between

rutting animals, which are capable of impregnation only at fixed seasons of the year; and those animals in which a coitus only is required to produce impregnation at any season. She, however, approaches much nearer in point of this analogy to the former class, her power of reproduction being infinitely the more active at her menstrual periods, to which the rutting time in brutes bears a strict physiological resemblance."

Before closing this chapter we will transcribe the conclusions to which Pouchet has arrived; not that we approve them in toto, but for the purpose of enabling the student to comprehend the doctrine, as laid down by this able observer.

1. The human species form no exception; the phenomena of their generation follow laws precisely analogous to those which are observed in other animals.

2. Observation has proved to a certainty, that, in the whole series of animals, from man to the sponge, generation is effected by means of eggs.

3. Numerous obstacles, physiological and physical, prevent, in the mammiferæ, the seminal fluid from coming in contact with the *ovule*, as long as this is contained within the Graafian vesicle.

4. Fecundation can only be accomplished when the *ovule* has acquired a certain degree of developement, and has escaped from the ovary.

5. In the whole animal series it is incontestably true, that the ovary discharges its ovules independent of fecundation.

6. In all animals the ovules are discharged at determinate periods, and in relation with the increased periodical excitement of the genital organs.

7. In the human species and in the mammiferæ, fecundation never takes place, unless the emission of the ovules coincides with the presence of the spermatic fluid.

8. Menstruation in the female corresponds with the phenomena of excitation which manifest themselves at the period of heat in the different beings of the zoological series, but especially in the females of the mammiferous animals.

9. Fecundation offers a constant relation with the catamenial flow; thus in the human species it is easy to fix, accurately, the intermen-

strual period, at which conception is physically impossible, and that at which it may probably occur.*

10. In the human species, and in the mammiferæ, the *ovum* and the *semen* meet normally in the uterus, or in that portion of the fallopian tubes which is near it, and it is at this point that fecundation occurs.

To these ten fundamental laws, Pouchet has added two others :

1. Certainly there exists no real instances of ovarian pregnancy.

2. Abdominal, or tubar pregnancies, do not prove that fecundation takes place normally in the ovaries.

The theory of generation may be summed up as follows :—the female furnishes the germ, egg, or ovule ; which pre-exists, or is produced, in indefinite numbers, in the ovarium ; which matures

* Pouchet also asserts that impregnation is only possible within the first twelve days *after* the cessation of the catamenia, and in this opinion he is supported by Dr. Meigs, the distinguished Professor of Obstetrics in Jefferson Medical College. To prove that this view is not correct, it will be necessary to refer to some of the facts which have already been cited. The case extracted from the work of Dr. Dewees, whose authority cannot be questioned, proves that a female may be impregnated one week before the occurrence of the catamenia ; while Pouchet, &c., assert that impregnation may occur as late as twelve days after the menstrual flow. Now, if these twelve days of susceptibility be added to the number of days previous to menstruation, during which fecundation may occur, as ascertained by Dr. Dewees, we will have nineteen days out of the twenty-eight, during which a female may be impregnated. But more than this, if we add to these nineteen days, four or five days for the duration of the menstrual flow, it will give us twenty-three or four days, out of the twenty-eight, during which a female is capable of impregnation ; leaving only four or five days as the length of time during which it is impossible. It may be objected, that Dr. Dewees asserts, that the female was “ within a week of her menstrual period,” and therefore we have no right to assume that it was seven days previous to the catamenia. To this we would reply, that the case *certainly* proves that impregnation may occur before the catamenia and is, therefore, in any point of view, destructive of the truth of the assertion laid down by Pouchet. But this is not our only proof ; M. Raciborski states that fecundation may occur a few days before the catamenial flow ; and Montgomery has reported a case in which it was accomplished three days before the catamenia commenced.

at certain periods, ruptures its natural covering, and is brought into contact with the seminal fluid, either at the ovary, or in the oviduct, or in the uterus. The male, on the contrary, furnishes a fluid, composed not of animalcules, but of bodies having the power of motion, like the epithelial cells, &c.; that these bodies are carried by an unknown power to the fallopian tubes, or even to the ovaries; when, meeting with the ovule divested of its coverings, by a union of the two, how, we know not, *vitality results*; the *being* thus formed, being composed of principles from each parent, will at times present traits of resemblance, both moral and physical, to either one or the other, or perhaps both parents.

CHAPTER V.

Description of the Ova, &c.—HAVING finished all that it was necessary to say on the physiology of the function of reproduction, we must pass to the consideration of the manner in which the *ova* are separated from the ovaries—their progress of developement, &c., after conception has taken place. To understand how these changes are effected, it will be necessary to examine the anatomical structure of the ovaries. In the lower animals these bodies are formed of a loose cellular tissue, containing many cells, in which the *ova* are found prior to maturation, during which period, they burst their envelopes and are discharged from the ovary. In the higher animals this cellular tissue is firmer, constituting what is called the STROMA; this stroma is said to be separated into compartments, by a tissue called the *tunica albuginea*. The surface of the ovary is covered over by its *indusium*, which is a peritoneal lamina. In the stroma are placed the *Graafian vesicles* or *follicles*, called by Barry, the OVISACS. In these ovisacs the *ova* are placed, and in the mammalia they are identical with the eggs of the oviparous animals, except that they have neither the albuminous fluid, constituting the white of the egg, nor the calcareous covering, constituting its shell.

The *ovisacs* differ from each other in size; and the number existing in each ovary varies; being never less than ten or twelve in number, and often more.*

The *ovisacs* are composed of two tunics—the external one, lying next to the stroma, is firm and fibrous in its character, and vascular, like the stroma: the internal tunic is neither so firm nor thick, and by some it is supposed to be destitute of vascularity, though this is

* Ritchie says that the *ova* and their containing cells (the ovisacs), are secreted and formed in indefinite numbers from the ovaries, by the inherent organism and power which the latter possess as glands. Their power of secretion is not limited, hence it is that an infinite number of *ova* are being constantly secreted.

denied by others. The two tunics lie very close to each other, and indeed it is often very difficult to separate the one from the other. The internal face of the inner tunic is filled with a mass of granules, floating in an albuminoid fluid, and in the midst of these granules the *ovum* is imbedded. In oviparous animals but little space exists between the ovum and the inner layer of the ovisac.

Subsequently, the granular matter, lying between the ovum and the inner layer of the ovisac, separates into two distinct portions; that lining the ovisac, is formed into a membrane, called by Barry the *membrana granulosa*; and at the same time the granules next to the ovum are developed into cells, which are also formed into a membranous structure, called the *tunica granulosa*,—these two membranes are connected together by bands of the same cellulo-membranous character, called *retinacula*.

A portion of the *tunica granulosa*, at the point where the ovum rests, is thickened by the deposition of a number of granules, and this part is called the “discus proligerus,” of Baer.

In oviparous animals, the yolk consists of granules enclosed in a yolk membrane. These granules consist of an albuminous and oily material, of a granulated or cellular appearance. Its centre being more cellular than the rest, has received the name of *vitelline disc*. In the centre of this vitelline disc is a large cell, called the *germinal vesicle* of Purkinjè; and on this cell may be seen a nucleus, termed by Wagner the *germinal spot*.

In the mammalia, the same thing exists, only the yolk is less abundant; because the new being, in this case, is nourished within a womb, by materials derived from the mother; whereas, in the oviparous animals, the yolk constitutes the source of nutrition to the new being for a much longer time. The membrane surrounding the yolk, in the mammalia, is called the *zona pellucida*; and the yolk consists of oily and albuminous materials, or granules, (1.5000 of an inch in diameter,) which, at the centre, are developed into a number of cells, called the *vitelline disc*; and within this one cell is seen, larger than the rest, what is called the *germinal vesicle*, the nucleus of which constitutes the *germinal spot*. The germinal vesicle, with its germinal spot, is considered, by Wharton Jones, the nucleated cell from which the new being is developed.

Previous to the maturation of the ova, they remain in the centre

of the *ovisac*, retained in their position by the *retinacula*. At the period of maturation, the *ova* begin to move to that side of the *ovisac* nearest the surface of the *ovarium*. This change of position on the part of the *ova*, is said to be due to a shortening of the *retinaculum* in that direction, by which the *ovum* is drawn towards the surface of the ovary. Though this may be true, yet the principal means, by which the *ova* are pushed towards the surface of the ovary, may be explained thus:—a deposition of blood between the *ovisac* and the ovary takes place, which pushes the *ovum* towards the surface of the ovary, where there is least resistance. By this pressure, the wall of the *ovisac*, next to the surface of the ovary, is gradually thinned, and finally bursts; and the *ovum* escapes, not only from the *ovisac*, but through the *indusium*; thence passing into the fallopian tubes. It is in this way, that during the period of excitation or maturation, the *ovum* is freed from its natural coverings in the ovary, and brought into contact with the seminal fluid. Before proceeding farther in the developement of the *ovum*, we must explain the nature of the *corpora lutea*. By the term *corpus luteum* we mean that which remains of the *ovisac* after the *ovum* has been expelled from it. It is a matter of much importance in a medico-legal point of view, to ascertain whether the existence of the *corpus luteum* is a sign of conception or not. Before deciding this much-disputed point, we must examine accurately the nature of these bodies, and see if there exists any real difference between the *corpus luteum* consequent upon conception, and that which follows the simple maturation of the *ovum*.

The *corpus luteum* may, according to Doctor Ritchie, be either white in its colour (*corpora albida*), or yellow (*corpora cephaloidea*), or red (*corpora rubra*). These bodies are friable in their consistence, very vascular, and seem to depend upon a hypertrophy of the *membrana granulosa*, which lines the interior of the *ovisac*. This hypertrophy of the granules, Raciborski thinks, commences before the *ova* have escaped from the follicle; but as soon as this takes place, the change increases greatly in activity. It has been a question of discussion whether this developement of granules, termed *corpus luteum*, takes place exterior to the *ovisac*, according to Lee and Jones; or between its layers, according to Barry and Montgomery; or on the internal face of the *ovisac*, according to Baer, Bischoff,

and Raciborski. Doctor Ritchie asserts that it may take place in either way ; but if the notion be correct, that this *corpus luteum* consists in an hypertrophy of the *membrana granulosa*, then the developement of this substance must be within the ovisac ; for we know that its inner tissue is lined by the *membrana granulosa* ; and this latter is left within the ovisac, when the ovum is discharged. Such is our notion, as it regards the mode in which this *corpus luteum* is formed.

The form of the corpus luteum is more or less oval ; the length of its long diameter measures about half an inch, while its breadth is somewhat less. The size of the corpus luteum varies very much ; thus, Dr. Clarke records a case, in which this body measured, at the end of the second month of pregnancy, in length nine and a half lines, in breadth eight lines, with a central cavity about three lines long and two broad, surrounded by the glandular structure of the corpus luteum ; of a thickness averaging three lines. Cases of a similar kind may be found recorded in the work of Dr. Montgomery.

Dr. Montgomery says : " Its structure is obviously and strikingly glandular, having a lobulated appearance, with slight convolutions, resembling not a little, a section of the human kidney ; or, as some one has said, it is like a miniature of the particular section of the brain, called by anatomists *centrum ovale*. Hunter describes it as tender and friable, like glandular flesh. Ræderer compares its structure to that of the supra-renal capsules."

The *corpus luteum* in the human being is of a dull yellow colour, and very vascular in its character ; an injection through the spermatic artery will pass easily into the substance of this body.

As gestation advances, the *corpus luteum* diminishes in size, its deep yellow colour fades, and, as has already been stated, its cavity becomes obliterated *about the fifth month of pregnancy*. It is admitted, by most writers on this subject, that all traces of this body are effaced four or five months after delivery, except a small pit over the spot where this body had previously existed. Dr. Montgomery mentions a case, in which, though the corpus luteum had nearly disappeared, the external cicatrix remained perfectly obvious until the fifth month after delivery ; and he adds, that "*beyond this period he has never detected the existence of the corpus luteum.*" It is an error to suppose that this *corpus luteum* is a permanent

structure, since upon the ovaries of females, who have borne several children, but one or two rents are discoverable. Again, it is said that in cases of twins, there will be but one *corpus luteum*; which is explicable only by supposing that the ovisac contained two ovules.

Dr. Montgomery speaks of its appearance, &c., in the following manner: "Its centre exhibits either a cavity, or a radiated or branching white line, according to the period at which the examination is made:—if within the first three or four months after conception, we shall, I believe, always find the cavity still existing, and of such a size as to be capable of containing a grain of wheat at least, and very often of a greater dimension; this cavity is surrounded by a strong white cyst; and, as gestation proceeds, the opposite parts of this cyst approximate, and at length close together, by which the cavity is completely obliterated, and in its place there remains an irregular white line, whose form is best expressed by calling it radiated or stelliform. This is visible as long as any distinct trace of the corpus luteum remains. I am unable to state exactly at what period the central cavity disappears or closes up, to form the stellated line. I think I have invariably found it existing, up to the end of the fourth month. I have one specimen, in which it was closed, in the fifth month, and another in which it was open in the sixth: later than this I have never found it.

"After the period of gestation has been completed, or the contents of the uterus prematurely expelled, so that gestation ceases, the *corpus luteum* soon begins to exhibit a very decided alteration in all its characters; until, at length, it is no longer to be found in the ovary. The exact period of its total disappearance I am unable to state; but I have found it distinctly visible, so late as at the end of five months after delivery; at the full time, but not beyond this period; and the *corpus luteum* of a preceding conception is never to be found along with that of a more recent, when gestation has arrived at its full term; but in cases of miscarriage, repeated at short intervals, it may.

"At the time of delivery the corpus luteum is neither so large nor so vascular as at the earlier periods of pregnancy, except the woman should happen, at the time of her death, to be labouring under inflammation of the uterine system; in which case the corpus luteum

partakes of the turgescence of the other parts, and, very remarkably, of their increased vascularity; a striking instance of which is represented in a preparation in the writer's museum, taken from the body of a woman who died of inflammation of the womb, two days after delivery; the central radiated white line is very distinct, and the vessels having been injected, the substance of the corpus luteum is quite crimsoned, and, externally, the ovary continues to exhibit the superficial cicatrix, and the alteration of form produced by the projection of the part containing the corpus luteum."

Many persons have considered the existence of a so-called true *corpus luteum* as an infallible test of previous conception; others have maintained that no distinction could be really made between the false and true *corpus luteum*; and that, therefore, the existence of this body could not be relied upon as a sign of impregnation. R. Lee, Wharton Jones, Montgomery and others, insist that there is a distinction between the true and false *corpora lutea*; while Bischoff, and originally Raciborski, asserted that the simple maturation of the *ova*, without either impregnation or coition, produced *corpora lutea* identical with those formed when conception occurs. Dr. Ritchie thinks that the *corpora rubra* may be regarded as truly indicative of conception, but that neither the *corpora cephaloidea* nor *albida* are of value in determining this point; indeed, he says, that the absence of the *corpora rubra* is not to be regarded as indicating that conception had not taken place.

Bischoff still maintains that the formation of *corpora lutea*, which takes place in animals during the period of heat, is also present in the human female. Though Raciborski at one time was of the same opinion with Bischoff, his views, as well as those of Pouchet, have undergone a change. They say that while in the animal a true *corpus luteum* may be formed during the period of heat, the same is not true in the human female; for in her, if the *ova* be expelled without fecundation, the granulations are certainly increased in size, but their activity in growth and size stops short when they have formed a thin yellowish membrane lining the interior of the ovisac; in which a clot of blood is found, more or less altered, according to the time at which it is examined. If conception takes place, and the *ovum* is expelled, the granules increase rapidly in size, &c., forming a yellow mass, which fills up the cavity of the

ovisac ; and in this case the *corpus luteum* remains until the end of pregnancy, but disappears after delivery. This is still an obscure question, though Dr. Montgomery's remarks upon the subject seem to us to settle it, especially as he is supported in his opinion by Lee, Jones, Raciborski, Pouchet, &c. He says, "In no one instance did I ever find a *true corpus luteum*, except as a product of conception ; and reasoning merely on the subject, I would ask, if mere imagination or highly excited desires, without intercourse, are capable of causing such a change in the condition of the ovary, should we not expect to find corpora lutea, almost invariably, in women who have been living with their husbands, or otherwise enjoying, constantly, the natural and perfect excitement of the generative system, without conception ? Of the non-occurrence of which consequence, I can speak in very decided terms, from numerous opportunities of making examinations under such circumstances."

Dr. Montgomery, after giving the opinions of various authors upon the subject, concludes by saying : "I have seen many of these virgin *corpora lutea*, as they are unhappily called, and have preserved several specimens of them ; but not in any one instance did they present what I should regard as even an approach to the assemblage of characters belonging to the true corpus luteum, the result of impregnation, from which they differ in all the following particulars :

1. There is no prominence or enlargement of the ovary over them.

2. The external cicatrix is almost always wanting.

3. There are often several of them found in both ovaries, especially in subjects who have died of tubercular disease, such as phthisis, in which case they appear to be merely depositions of tubercle, and are frequently without any discoverable connection with the Graafian vesicles.

4. They present no trace whatever of vessels in their substance, of which they are in fact entirely destitute, and of course cannot be injected.

5. Their texture is sometimes so infirm that it seems to be merely the remains of a coagulum, and at others appears fibro-cellular, like that of the internal structure of the ovary ; but never presents the soft, rich, lobulated, and regularly glandular appearance which

Hunter meant to express, when he described them as “tender and friable, like glandular flesh.”

6. In form they are often triangular or square, or of some figure bounded by straight lines.

7. They never present either the central cavity or the radiated or stelliform white line which results from its closure.

This latter peculiarity, in common with several others observable in these spurious productions, (whether occurring in virgins or in other women, but not the result of conception,) even when they are connected with a Graafian vesicle, depends on their different mode of formation; a circumstance which deserves especial attention, as pointing out the essential difference between a very large class of these pseudo-structures and the true ones.

The history of their formation appears to me to be this: accidental or morbid determination takes place towards a vesicle, in consequence of which it is distended with fluid, and either bursts and discharges its contents (in which case there may be found an external cicatrix) or the fluid is again absorbed; but, in either case, there is often deposited on the internal surface of the vesicle, a substance somewhat resembling the *corpus luteum* in colour, but in general not more than about one-sixteenth of an inch in thickness, and entirely destitute of blood-vessels: sometimes it is very much thinner even than this, amounting to little more than a mere layer of colouring matter lining the vesicle. In this condition I have often found them, the vesicle being enlarged to three or four times its natural size, full of fluid, and its internal surface of a bright yellow colour; but when the vesicle collapses, either in consequence of rupture of its coats, or the absorption of the contained fluid, the inner surface of this new deposit closes upon itself, and forms an irregular line of junction, which is generally darker than the rest of the structure, and not unfrequently they present the yellow colour only on the circumference, while their centre is so dark as to be almost black; but, from their situation, they are entirely without lining membrane, to form either a central cavity or white stellated line, which, in the true *corpus luteum*, is formed by the closure of the inner coat of the *vesicle*; for the same reason also, these accidental formations are in general much smaller than the others; and they are moreover totally without vessels in their structure, so that, however minutely the rest of the

ovary may be pervaded by fine injection, not a particle of it will pass into the bodies thus formed."

We may conclude then that the corpus luteum, resulting from conception, differs considerably from that formed after the maturation and discharge of ova, independent of coitus. Why this difference should exist, it is difficult to say, since the organic process of maturation and discharge is identical in the two cases. It has been supposed that the vivification of the germ, and its subsequent retention within the uterus, may exert a reflex influence sufficient to vary the degree of development of the granules, which line the inner membrane of the ovisac.

In a late communication made to the Philosophical Society, Professor Meigs maintains that the yellow matter found in a corpus luteum, is "of the same apparent structure, form, colour, coagulability, and refractive power" as the yolk of eggs;—this is a novel opinion, and entirely at variance with the opinion of most of the physiologists of the present day. Since the publication of Professor Meigs' pamphlet, we have no doubt that the accuracy of his opinion upon this subject will be tested by thorough investigation with the microscope.

Having thus far shown, how it is that the *ova* are freed from those investments which they receive from the ovary and ovisac, we will now proceed to examine the mode in which the *ovum* is so divested of its own coverings, as to be brought into immediate contact with the spermatic fluid—for, in order that fecundation shall be effected, the *germinal vesicle* of the *ovum* must be subjected to the action of the male fluid—and this can only be done by a rupture of the zona pellucida surrounding it.

From the germinal vesicle and spot, a constant succession of temporary cells are generated, by which the zona pellucida is stretched until it gives way; and this always takes place at the point where the germinal spot exists, immediately under the opening caused by the rupture of the indusium, &c. In this way, and at this time, fecundation takes place;—all the non-permanent cells are now destroyed, having performed their object; two new cells, originating from the germinal spot, are now to be seen, and these retire within the zona pellucida, the cleft in which becomes closed up. These two new cells within the germinal vesicle, now undergo

important changes—a succession of other cells is formed, and in their turn undergo destruction and liquification; until, after numerous changes too tedious to mention, two new cells appear in the pellucid centre of the nucleated germinal vesicle, and *these* are developed at the expense of all the rest, and being nourished by the contents of the yolk, constitute the permanent cells from which the embryo proceeds. These important changes take place during the passage of the expelled ovum through the oviduct; or they may even take place in the ovary; this, however, will depend upon the rapidity with which the ovum is expelled from the ovary, after coition has taken place.

During the passage of the fecundated ovum to the uterus, it receives the covering called the amnion, or the lamina serosa of authors; supposed to consist of a condensed layer of epithelial cells, which line the inner face of the *zona pellucida* or *vitelline membrane*;—about this matter there still exists a good deal of doubt.

Wharton Jones maintains that the chorion is also formed in the fallopian tubes; of its mode of formation he gives the most satisfactory account; he asserts that the *zona pellucida*, during its passage through the oviduct, is surrounded by a gelatinous matter, around which a membrane is formed; and Carpenter suggests that the gelatinous matter may correspond to the white of the egg, and the chorion to its *envelope*, as found in the eggs of oviparous animals. On the sixth day small inequalities are observable over the surface of the ovum, which are discovered to be the villi of the chorion, through which the nutritive material is conducted from the mother to the fœtus. The villi of the chorion, after the ovum has reached the cavity of the uterus, forms a close connection with the internal surface of the uterus, in the way which we shall describe hereafter.

The further developement of the fœtus is thus given by Devergie:

“*Embryo of three to four weeks.*—It has the form of a serpent; its length from 3 to 5 lines; its head indicated by a swelling; its caudal extremity (in which is seen a white line, indicating the continuation of the medulla spinalis,) slender, and terminating in the umbilical cord; the mouth indicated by a cleft; the eyes by two black points; the members begin to appear as nipple-like protuberances; the liver occupies the whole abdomen; the bladder is very

large; the chorion is villous, but its villousities are still diffused over its whole surface.

Embryo of six weeks.—Its length from 9 to 10 lines; its weight from 40 to 75 grains; face distinct from the cranium; aperture of nose, mouth, eyes and ears perceptible; head distinct from the thorax; hands and forearms in the middle of the length; fingers distinct; legs and feet situated near the anus; clavicle and maxillary bone present a point of ossification; distinct umbilicus for attachment of the cord, which at that time consists of the omphalo-mesenteric vessels, of a portion of the urachus, of a part of the intestinal tube, and of filaments which represent the umbilical vessels; the placenta begins to be formed; the chorion still separated from the amnion; the umbilical vesicle very large.

Embryo of two months.—Length from 16 to 19 lines; weight from 150 to 300 grains; the elbows and arms detached from the trunk; heels and knees also isolated; rudiments of the nose and lips; palpebral circle beginning to show itself; clitoris or penis apparent; anus marked by a dark spot; rudiments of the lungs, spleen and supra-renal capsules; cæcum placed behind the umbilicus; digestive canal withdrawn into the abdomen; urachus visible; osseous points in the frontal bone and in the ribs; chorion commencing to touch the amnion at the point opposite the insertion of the placenta; placenta begins to assume its regular form; umbilical vessels commence twisting.

Embryo of three months.—Length from 2 to 2½ inches; weight from 1 to 1½ oz. (Troy); head voluminous; eyelids in contact by their free margin; membrana pupillaris visible; mouth closed; fingers completely separated; inferior extremities of greater length than rudimentary tail; clitoris and penis very long; thymus as well as supra-renal capsules present; cæcum placed below the umbilicus; cerebrum 5 lines, cerebellum 4 lines, medulla oblongata 1½ lines, and medulla spinalis ¾ of a line in diameter; two ventricles of heart distinct; the decidua reflexa and decidua uterina in contact; funis contains umbilical vessels and a little of the gelatin of Warthon; placenta completely isolated; umbilical vesicle, allantois, and omphalo-mesenteric vessels have disappeared.

Fœtus of four months.—Length 5 to 6 inches; weight 2½ to 3 oz.; skin rosy, tolerably dense; mouth very large and open; mem-

brana pupillaris very evident ; nails begin to appear ; genital organs and sex distinct ; cæcum placed near the right kidney ; gall-bladder appearing ; meconium in duodenum ; cæcal valve visible ; umbilicus placed near pubis ; ossicula auditoria ossified ; points of ossification in superior part of sacrum ; membrane forming at a point of insertion of placenta on uterus ; complete contact of chorion with amnion.

Fœtus of five months.—Length 6 to 7 inches ; weight 5 to 7 oz. ; volume of head still comparatively great ; nails very distinct ; hair beginning to appear ; skin without sebaceous covering ; white substance in cerebellum ; heart and kidneys very voluminous ; cæcum situated at inferior part of right kidney ; gall-bladder distinct ; germs of permanent teeth appear ; points of ossification in pubis and calcaneum ; meconium has a yellowish-green tint, and occupies commencement of large intestine.

Fœtus of six months.—Length 9 to 10 inches ; weight 1 lb. ; skin presents some appearance of fibrous structure ; eyelids still agglutinated, and membrana pupillaris remains ; sacculi begin to appear in colon ; funis inserted a little above pubis ; face of a purplish red ; hair white or silvery ; sebaceous covering begins to present itself ; destitute of bitterness ; testes near kidneys ; points of ossification in four divisions of sternum ; middle point at lower end of sternum.

Fœtus of seven months.—Length 13 to 15 inches ; weight 3 to 4 lbs. ;—skin of rosy hue, thick, and fibrous ; sebaceous covering begins to appear ; nails do not yet reach extremities of fingers ; eyelids no longer adherent ; membrana pupillaris disappearing ; a point of ossification in the astragalus ; meconium occupies nearly the whole of large intestine ; valvulæ conniventes beginning to appear ; cæcum placed in right iliac fossa ; left lobe of liver almost as large as right ; gall-bladder contains bile ; brain possesses more consistency ; testicles more distant from kidneys ; middle point at a little below end of sternum.

Fœtus of eight months.—Length 14 to 16 inches ; weight 4 or 5 lbs. ; skin covered with well-marked sebaceous envelope ; nails reach extremities of fingers ; membrana pupillaris becomes invisible during this month ; a point of ossification in last vertebra of sacrum ; cartilage of inferior extremity of femur presents no centre of ossification ; brain has some indications of convolutions ; testicles descend

into internal ring; middle point nearer the umbilicus than the sternum.

Fœtus of nine months, the full term.—Length from 17 to 21 inches; weight from 5 to 9 lbs., the average probably about $6\frac{1}{2}$ lbs.; head covered with hair in greater or less quantity, of from 9 to 12 lines in length; skin covered with sebaceous matter, especially at bends of joints; membrana pupillaris no longer exists; external auditory meatus still cartilaginous; four portions of occipital bone remain distinct; os hyoides not yet ossified; point of ossification in the centre of cartilage at lower extremity of femur; white and gray substances of brain become distinct; liver descends to umbilicus; testes have passed inguinal ring, and are frequently found in scrotum; meconium at termination of large intestine; middle point of body at umbilicus, or a little below it.”

We extract, also, from Carpenter’s Physiology, the following researches of Quetelet, into the physical condition of the fœtus, from which it will be seen that, in a majority of cases, the male children are both larger and longer than the female.

“The length of the body in fifty new-born infants of each sex, as ascertained by Quetelet, was as follows :

		Males.	Females.	Total.
From 16 to 17 inches (French)	-	2	4	6
“ 17 to 18 “	- - - - -	8	19	27
“ 18 to 19 “	- - - - -	28	18	46
“ 19 to 20 “	- - - - -	12	8	20
“ 20 to 21 “	- - - - -	0	1	1

From these observations, the mean and the extremes of the lengths of the male and female respectively, were calculated to be :

	Males.	Females.
Minimum - - -	16 inches, 2 lines	16 inches, 2 lines
Mean - - - -	18 “ 6 “	18 “ $1\frac{1}{2}$ “
Maximum - - -	19 “ 8 “	20 “ 6 “

Notwithstanding that the maximum is here on the side of the female (this being an accidental result, which would probably have been otherwise, had a larger number been examined), the average shows a difference of $4\frac{1}{2}$ lines in favour of the male. The inequality in

the weight of the two is even more remarkable ; the observations of M. Quetelet were made upon 63 male and 56 female infants.

Infants weighing from	Males.	Females.	Total.
1 to $1\frac{1}{2}$ kilog.* - - - - -	0	1	1
$1\frac{1}{2}$ to 2 " - - - - -	0	1	1
2 to $2\frac{1}{2}$ " - - - - -	3	7	10
$2\frac{1}{2}$ to 3 " - - - - -	13	14	27
3 to $3\frac{1}{2}$ " - - - - -	28	23	51
$3\frac{1}{2}$ to 4 " - - - - -	14	7	21
4 to $4\frac{1}{2}$ " - - - - -	5	3	8

The extremes and means were as follows :

	Males.	Females.
Minimum - - - - -	2.34 kilog.	1.12
Mean - - - - -	3.20 "	2.91
Maximum - - - - -	4.50 "	4.25

The average weight of infants of both sexes, as determined by these inquiries, is 3.05 kilog., or 6.7 lbs. ; and this corresponds almost exactly with the statement of Chaussier, whose observations were made upon more than 20,000 infants. The mean obtained by him, without reference to distinction of sex, was 6.75 lbs. ; the maximum being 11.3 lbs., and the minimum 3.2 lbs. The average in this country is probably rather higher ; according to Dr. Joseph Clarke, whose inquiries were made on 60 males and 60 females, the average of male children is $7\frac{1}{3}$ lbs. ; and that of females $6\frac{2}{3}$ lbs. He adds, that children which at the full time weigh less than 5 lbs. rarely thrive ; being generally feeble in their actions, and dying within a short time. Several instances are on record, of infants whose weight at birth exceeded 15 lbs. It appears that healthy females, living in the country, and engaged in active but not over-fatiguing occupations, have generally the largest children ; and this is what might be expected *à priori*, from the superior activity of their nutritive functions."

* The kilogramme is equal to $2\frac{1}{5}$ lbs. avoirdupois.

CHAPTER VI.

SECTION I.—Having described the mode in which the ovule is vivified and developed, it becomes necessary to explain the arrangement of the membranes, which surround the fœtus in utero; the connection of these membranes with the uterus; and the manner in which the fœtus is nourished, during the whole period of utero-gestation.

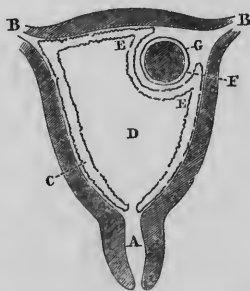
When conception has taken place, a new substance is formed upon the internal wall of the uterus, which has been termed the *membrana decidua*, or *membrana caduca*. By the older writers, and by many of the present day, this membrane is regarded as a new formation, resulting from an exudation of coagulable lymph, upon the interior of the uterine cavity. The external surface of this membrane is rough and velvety, and closely adherent to the wall of the uterus; while its internal or free surface is smooth. The thickness of the decidua is about three lines. This membrane is said, by many, to be formed independent of the arrival of the vivified ovum into the uterine cavity. On this point, Dr. Lee differs with the majority of writers, in asserting that the function never occurs unless the ovum reaches the cavity of the womb; though he admits that it is formed before the ovum enters that cavity. From the latter circumstance, we would infer that the exudation of this membrane, being the result of the act of conception, would take place, whether the fecundated ovum reached the cavity of the uterus or not; and that, therefore, we should expect to find it, even in cases of extra-uterine pregnancy. The deciduous membrane is not permanent in its character; being formed at conception, and discharged when the ovum and its membranes are expelled from the uterus.

If we admit, with the older writers, that this formation is the result of an exudation upon the interior of the uterine cavity, the mode in which it is made to envelope the ovum is explained in the following manner:—the ovum, when vivified, passes through the fallopian

tubes toward the cavity of the uterus; and when it arrives at the uterine extremity of the tubes, it meets with a portion of the *membrana decidua*, which it pushes before it, until the whole ovum is surrounded by this membrane (see fig. 10). That portion of the deciduous membrane which is in contact with the ovum, is called the *decidua reflexa*; while the portion which remains in contact with the uterine walls is called the *decidua vera*. The space between these two portions of the *membrana decidua* constitutes the cavity of the decidua; which, at first, is very large, and filled with a serous fluid, which has been termed by M. Breschet the *hydropèrion*. As the ovum increases in size, the cavity of the decidua diminishes, until finally the two layers become agglutinated into one membrane. This last statement is denied by Velpeau. The existence of the decidua reflexa has been denied by some writers, upon the ground that, in aborted ova, it is often impossible to separate one layer from the other.

In the arrangement just described, we have purposely omitted to state, that, according to Hunter, there were three openings in the *membrana decidua*; *one* at each orifice of the fallopian tube, and *one* at the orifice, leading from the cavity of the uterus to that of the cervix. The existence of these three foramina has been denied by many excellent observers; and if the fact were admitted, would it not be probable, that the ovum in entering the uterus, instead of pushing a portion of the membrane before it, would pass immediately through the opening, into the cavity of the decidua? And if this took place, we would have no decidua reflexa; in which case, the ovum would be surrounded by only one layer of the membrane; whereas, under the explanation above given, it pushes itself into a closed sac, and consequently is almost entirely enveloped by two lamina of the *membrana decidua*. We say *almost entirely enveloped*; for where the decidua was detached from the uterine wall by the advancing ovum, the latter is covered neither by the decidua

Fig. 10.



BB. Opening of Fallopian Tubes.

D. Cavity of the Decidua.

EE. Decidua Reflexa.

C. Decidua Vera.

vera nor the decidua reflexa. This space is that at which the placenta is subsequently formed, by the development of a new structure, resembling the membrana decidua, termed the decidua serotina, (see fig. 11, *f*,) which is not formed till a later period of gestation.

Fig. 11.

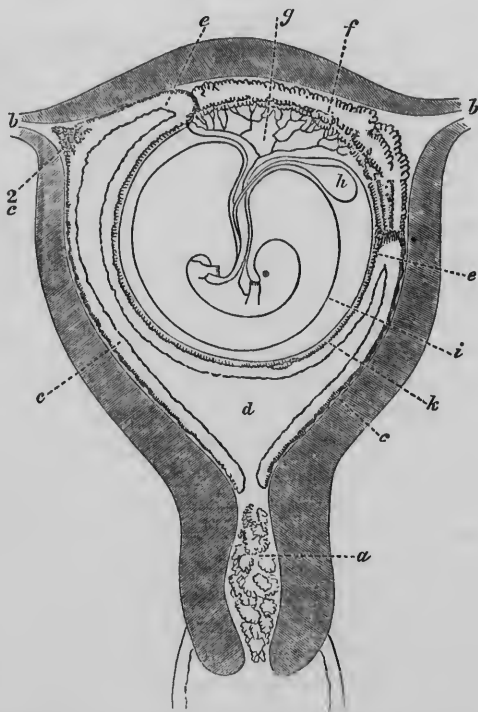


Diagram of Human Ovum, at the time of formation of the placenta; *a*, muco-gelatinous substance, blocking up os uteri; *b*, *b'*, fallopian tubes; *c*, *c'*, decidua vera, prolonged at *c* 2, into fallopian tube; *d*, cavity of uterus, almost completely occupied by ovum; *e*, *e'*, angles at which decidua vera is reflected; *f*, decidua serotina; *g*, allantois; *h*, umbilical vesicle; *i*, amnion; *k*, chorion, lined with outer fold of serous tunic.

But, plain and satisfactory as is this explanation of the nature and arrangement of the membrana decidua, its truth has been denied by Dr. Sharpey, Professor Weber, and M. Coste. It is asserted by Dr. Reid, that the mucous membrane of the uterus is tubular in its cha-

racter, and that the thickening and increased vascularity of this structure constitutes the membrana decidua. This view of the structure of the mucous membrane of the uterus constitutes the basis of the opinions of Sharpey, Coste and Weber. The latter's account of the mode in which this deciduous membrane is formed, is as follows: The membrana decidua is composed principally of a mass of uterine glands, closely knit together, and abounding in blood-vessels, which pierce the deciduous membrane. When a section of the uterus, covered with the membrana decidua, is examined with a microscope, these glands (or tubes as they are called by Reid) are seen to be thin and cylindrical at their point of attachment with the decidua; but the extremity which lies next to the tissue of the uterus is much thicker. Out of the orifice of these glands or tubes a colourless fluid may be expressed. The principal change which occurs in these cylindroid tubes, when conception takes place, is this; they are rendered thicker, more vascular and softer, so as to allow the more easy desquamation of the structure.

If these views be true, then we are to regard the membrana decidua not as a newly-developed product, but as a portion of the mucous tissue of the uterus. Dr. Carpenter asks, with a good deal of force: if these views be well-founded, how are we to explain the formation of the decidua continuously over the upper orifice of the cervix uteri, and over the orifices of the fallopian tubes, as is frequently, though not always the case? It must be confessed that this subject requires still farther elucidation.

According to Moreau, the uses of the membrana decidua are: 1, to prevent the embryo from floating too freely in the uterine cavity: 2, to maintain it in contact with the internal surface of the uterus a sufficient length of time to allow the proper adherence between the two: 3, the adhesion formed between the embryo and the uterus gives origin to the placenta, through which the blood of the mother is conducted to the body of the fœtus: 4, the formation of the decidua effectually prevents the occurrence of superfœtation.

The Chorion.—This membrane surrounds, as we have already seen, the *ovum* previous to its entrance into the uterine cavity. It is thin and transparent, resembling in its character the serous membranes; its external surface, or that next to the membrana decidua, very early in pregnancy becomes covered with velvety prolonga-

tions ; which, by attaching themselves to the decidua, are capable of absorbing material from the blood of the mother, for the nutrition of the fœtus. These velvety prolongations become, as pregnancy advances, exceedingly vascular ; and, where the chorion comes in contact with the decidua serotina, they increase greatly in size and vascularity, giving origin to the placenta. As the formation of the placenta and the course of the fœtal circulation become perfected, the chorial prolongations which connect this membrane with the decidua reflexa, diminish in size, and the space intervening between the chorion and decidua becomes closed by the complete agglutination of these two membranes. The internal face of the chorion, in the advanced period of pregnancy, is in contact with the amnion ; but, during the early months, as the amniotic sac is smaller than that of the chorion, a considerable space intervenes between the two membranes, which is filled with an albuminoid fluid, the more abundant as the pregnancy is less advanced.

By some persons the chorion is supposed to consist of only one lamina, while others consider that there are two ; in which case, one layer serves as a covering to the umbilical cord. The vascularity of this membrane has also been a subject of dispute. On these two points of difference, M. Cazeaux holds the following language : “ It is useless, after what we have said, to discuss the question of the vascularity of the chorion ; for it is evident that it only becomes vascular after the developement of the allantois. From this period it is composed of two layers ; the one *external*, or the primitive chorion, which is called *exochorion*, is completely deprived of vessels ; the other, *internal* or allantoid, essentially vascular, has received the name of *endochorion*.” This we believe is the correct view.

The *amnion* is the third and most internal of the membranes which surround the fœtus. It is thin and transparent, but more dense than the chorion, to which its external surface is connected, by means of cellular tissue. The internal face looks toward the fœtus, from which, however, it is separated by a greater or less abundance of the amniotic fluid. The amount of this fluid varies ; in the first months of utero-gestation, the amount is very large, in proportion to the size of the embryo. About the middle of pregnancy, the weight of the amniotic fluid is nearly equal to that of the

embryo; but, from this time, till the termination of utero-gestation, its weight becomes much less, when compared with that of the fœtus. At delivery, the quantity amounts, as an average, to a pint and a half.

The amnion lines the chorion, and when it reaches the point where the umbilical cord is inserted into the placenta, it passes down, so as to cover completely the whole length of the cord. When it arrives at the umbilicus, the amnion is supposed to become continuous with the epidermis of the fœtus. M. Breschet and M. Serres, assert that the membrane is reflected from the umbilicus, so as to form a complete envelope for the body of the fœtus. This envelope, they think, desquamates during the first month after birth.

The amnion resembles the serous membranes, and seems to be destitute of blood-vessels and nerves;—its use, like the chorion, is to protect the embryo, and to contain the amniotic fluid.

The amniotic fluid is variable in quantity; as we have already said, it is composed of water, albumen, muriate of soda, phosphate of lime, &c. The source, from which this fluid proceeds, has been a matter of dispute among physiologists; some think it proceeds from the mother; while others maintain that it is the product of the fœtus. Velpeau considers it the result of a simple exudation from the amniotic membrane, similar to that which takes place from other serous membranes. We are disposed to adopt the opinion of Burdach; who says that this fluid proceeds from the internal face of the uterus, and is conducted, by imbibition, through the membranes into the cavity of the amnion. The uses of this fluid are: 1, to aid in the nutrition of the fœtus, previous to the establishment of the fœtal circulation: 2, to protect it from the effects of blows or falls: 3, to allow the free motion of the fœtus in the uterus: 4, to allow the regular expansion of the uterus, and to prevent the compression of the umbilical cord: 5, to prevent the evil effects of uterine contraction upon the body of the fœtus, until the soft parts are in a fit condition to allow the expulsion of the child: 6, to aid, by means of the bag of waters, the gradual dilatation of the os uteri.

Umbilical Vesicle.—This is a pyriform sac, formed by the mucous lamina of the ovum. It exists only during the first three or four months of gestation, when its size is considerable, as may be seen by reference to figure 11. This sac is situated between the amnion

and chorion, and communicates, by a long pedicle, with the intestine. The duct passes through the umbilicus into the intestine, and remains open till the sixth or eighth week of gestation. The sac is formed by two layers of membrane, and is filled with a yellowish liquid. The umbilical vesicle is abundantly supplied with blood-vessels; which have received the name of *omphalo-mesenteric*, *mese-raic* or *vitelline* vessels. Dr. Carpenter says, "It was formerly believed that the nutrient matter of the yolk passes directly through the vitelline duct, into the (future) digestive cavity of the embryo, and is from it absorbed into its structure; but there can now be little doubt, that the vitelline vessels are the real agents of absorption, and that they convey it to the tissues in process of formation." As pregnancy advances, the vitelline duct closes up, and the sac becomes gradually fused into the cord.

The Allantois.—The existence of this membrane in the human embryo, was, for a long time, denied; but more accurate investigation has placed its existence beyond a doubt. The office of this membrane, which bears a proportionate size to the dissemination of the placental mass, is to conduct blood from the embryo to the chorion. It diminishes in size as the continuous vessels of the cord and the placental structure are developed. The following account is given of the allantois by Dr. Carpenter: "With the evolution of a circulatory apparatus, adapted to absorb nourishment from the store prepared for the use of the embryo, and to convey it to its different tissues, it becomes necessary that a respiratory apparatus should also be provided, for unloading the blood of the carbonic acid with which it becomes charged during the course of its circulation. The temporary respiratory apparatus, now to be described, bears a strong resemblance in its own character, and especially in its vascular connections, with the gills of the mollusca; which are prolongations of the external surface, (usually near the termination of the intestinal canal,) and which almost invariably receive their vessels from that part of the system. This apparatus is termed the allantois. It consists at first of a kind of diverticulum or prolongation of the lower part of the digestive cavity, the formation of which has been already described. This is at first seen as a single vesicle, of no great size; and in the fœtus of mammalia, which is soon provided with other means of ærating its blood, it seldom attains any considerable dimen-

sions. In birds, however, it becomes so large as to extend itself around the whole yolk-sac, intervening between it and the membrane of the shell; and through the latter it comes into relation with the external air. The preceding diagram (fig. 11) will serve to explain its origin and position in the human ovum. The chief office of the allantois in mammalia is to convey the vessels of the embryo to the chorion; and its extent bears a pretty close correspondence with the extent of surface, through which the chorion comes into vascular connection with the decidua. Thus, in the carnivora, whose placenta extends like a band around the whole ovum, the allantois also lines the whole inner surface of the chorion, except where the umbilical vesicle comes in contact with it. On the other hand, in man and the quadrumana, whose placenta is restricted to one spot, the allantois is small, and conveys the fœtal vessels to one portion only of the chorion. When these vessels have reached the chorion, they ramify in its substance, and send filaments into its villi; and in proportion as these villi form that connection with the uterine structure, which has been already described, do the vessels increase in size. They then pass directly from the fœtus to the chorion, and the allantois being no longer of any use, shrivels up, and remains as a minute vesicle, only to be detected by careful examination. The same thing happens in regard to the umbilical vesicle, from which the entire contents have been by this time exhausted; and from henceforth the fœtus is entirely dependent for the materials of its growth, upon the supply it receives through the placenta, which is conducted to it by the vessels of the umbilical cord. This state of things is represented in the preceding diagram, (fig. 11.) The allantois has a correspondence in situation with the urinary bladder; but it is only the lower part of it, pinched off, as it were, from the rest, that remains as such. The duct by which it is connected with the abdomen gradually shrivels; and a vestige of this is permanent, forming the *urachus* or suspensory ligament of the bladder, by which it is connected with the umbilicus. Before this takes place, however, the allantois is the receptacle for the secretion of the *corpora wolffiana*, and of the true kidneys, when they are formed."

The placenta is a soft, spongy substance, which forms the principal connection between the embryo and the uterus. It is of a circular or oval shape, and measures about six or seven inches in

diameter. The thickness varies considerably ; but when of ordinary size, it measures about an inch at its centre and somewhat less at the circumference. The umbilical cord is inserted usually into its centre—at times, however, this insertion takes place near the circumference.

The placenta presents two faces for consideration ; one *external* or *uterine*, the other *internal* or *fœtal*. The fœtal surface is covered by the chorion and amnion ; and over its whole extent the ramification of the umbilical veins and arteries is observable. The external surface, when detached from the wall of the uterus, presents a rough appearance ; divided by deep sulci into a number of lobes or cotyledons, which at the bottom of these sulci are connected with each other by a loose cellular tissue ; through each cotyledon, branches of the umbilical artery and vein circulate.

The rudiment of the placenta is observable about the end of the first month of pregnancy ; and during the third month the mass has acquired its proper character, when it goes on increasing in size, *pari passu* with the growth of the fœtus. The formation of the placenta is due to the penetration of the cellular prolongations of the chorion into the tubulated structure of the decidua serotina.

The connection which exists between the blood-vessels of the mother and those of the fœtus, has long been a subject of dispute. The two most satisfactory explanations of this connection have been given by Weber and Reid. We extract from Wagner's Physiology the views of the former, which are as follows :—

He says, "Eschricht of Copenhagen, in an interesting academical tract, entitled, *De Organis quæ respiratione fœtus mammalium inserviunt, Prolusio Academica*, Hafniae, 1837, 4to, shows that he agrees with me in many points in regard to the structure of the placenta of man and animals, whilst on others he proclaims his dissent. The particulars in which he agrees with me are the following: 1. That the arteries and veins of the uterus, the channels of the mother's blood, penetrate in great numbers into the placenta, and are distributed throughout its substance in such wise, that every one of its minutest lobules has a canal carrying the blood of the mother, and so comes into contact with the vessels, in which the blood of the embryo is flowing. Here we both differ from Seiler, who believed himself authorized to conclude that no vessels from the mother penetrated the placenta ; but that the maternal vessels only came

into contact with the surface of the placenta, where it was bounded by the uterus. 2. The umbilical arteries of the embryo divide, in the manner of a tree, into very numerous and minute branches, which finally turn round, forming loops and anastomoses, and again collect into larger and fewer branches, which at length unite into a single trunk, and form the umbilical vein. Nowhere do the maternal and fetal vessels anastomose; nowhere is there any transmission of blood from the one class of vessels to the other; nowhere do we encounter open-mouthed terminations of vessels. 3. The whole placenta, and therefore every individual lobule entering into its structure, consists of two distinct parts; the one a continuation of the chorion and vessels of the embryo, the other a continuation of the membrana decidua and vessels of the uterus. From the chorion, for instance, dendritic processes or elongations are sent out; which, in small ova, about a month old, are so small and simple, that they are called villi, but which grow by and by into large and numerous-divided stems and branches. Into each of these dendritic processes of the chorion there penetrates a branch of the umbilical artery, and a branch of the umbilical vein. Both vessels divide into branches in the same manner as the process of the chorion in which they run. At the extremities of the branched process of the chorion the divisions of the umbilical artery come together in loops or coils; these coils, however, are for the most part not simple; the same capillary winds several times hither and thither, and forms several loops; loops are also frequently formed by the anastomosing of two neighbouring capillaries. From these convolutions and loopings of the capillaries, little thickenings or enlargements of the extreme divisions of the processes of the chorion are produced. Each particular trunk, with its divarications of the shaggy chorion, forms a lobe or lobule of the placenta, which is covered by the tunica decidua. To this investment many of the terminal branches of the chorion will be found to have grown. It is in spaces between the divarications of the chorion, that those vessels run, which transmit the blood of the mother, and which are prolongations of the uterine arteries and veins; they penetrate in this way to even the most minute lobule of the chorion. 4. The object of this structure seems to be, that the minute, convoluted, greatly elongated, and extremely thin-walled capillaries in which the blood of

the fœtus is circulating, may be brought into the most intimate contact possible, with the larger but everywhere excessively thin-walled canals, in which the blood of the mother is flowing; that the two currents, without interfering with each other's motion, may pass each other to as great an extent as may be, with nothing interposed but the delicate parieties of each set of vessels; that they may exert an influence one upon another; the blood of the mother abstracting matter from that of the fœtus, and the blood of the fœtus taking, in its turn, matter from that of the mother. Eschricht differs from me in this, that he believes the uterine arteries and veins distributed to the placenta are connected together by as delicate, or even a more delicate system of capillaries, as that of the umbilical arteries; and in such a way that two systems of capillaries, that belonging to the child to wit, and another to the mother, are brought into intimate contact. I, on the other hand, believe I have demonstrated that the uterine arteries and veins, once they have entered the spongy substance of the placenta, do not farther divide into branches and twigs, but immediately terminate in a network of vessels, the canals of which are of far too large diameter to permit them to be spoken of as capillaries, and of which the parietes are so thin, that they cannot be shown apart by the most careful dissection. This vascular rete, which connects the uterine arteries and veins with each other, completely fills the spaces between the branched divisions of the chorion; and the extremely thin parieties of the canals of which it is composed, insinuate themselves at all points into the most intimate contact with the branches and convoluted masses of the capillaries of the umbilical system of vessels. This network of vessels, however, with reference to the passage of the uterine arteries into the uterine veins, performs the same office, and as a *rete* of true capillaries, so that it may be regarded as a *rete* of colossal capillaries.

Eschricht maintains that plicated processes of the decidua penetrate the placenta, and may be traced between the branched divisions of the chorion, furnishing the several twigs with a delicate investment; and that these plicæ are the supporters of a capillary rete, by which the uterine arteries and veins are connected in the placenta. I, on the other hand, maintain, that the walls of the uterine arteries and veins, where they penetrate the placenta, consist of a very delicate tunic, a prolongation, as it seems, of the inner tunic of

the vessels of the uterus, covered with a layer derived from the substance of the decidua; that the inner tunic of the blood-vessels lines the interspaces between the divisions of the shaggy chorion; and that the little masses of convoluted vessels or villi, which terminate the branches of the chorion, penetrate the canals which transmit the blood of the mother, and are bathed by it in their interior. In my mode of stating my views, I must, I fear, have left room for misapprehension, as I could perceive in the course of my conversation with Eschricht, that I had not been understood in the way I intended. I have not, I imagine, explained with sufficient clearness what I mean by *villi that penetrate the vascular canals of the mother*. This deficiency I take occasion to supply here. I do not, then, understand by villi, entire stems of the chorion, with all their subdivisions, as they appear when they are torn forcibly out of the placenta, but small projections or elevations that occupy these in points, or occur over every part of the stems and branches, and are formed by the terminal loopings and communications of the embryonic placental capillaries. Magnifying glasses are required to perceive these proper villi distinctly. In the second place, I have said: 'the vessels of the uterus that penetrate the placenta become wider when they have entered it.' This expression is objectionable, at least in reference to the veins of the fully developed placenta, and I would therefore recall it."

The view of Dr. Reid is thus explained in Carpenter's work on Physiology. "The maternal portion of the placenta may be regarded, according to Dr. J. Reid, as consisting of a large sac formed by a prolongation of the inner coat of the uterine vessels; against the foetal surface of this sac, the tufts just described may be said to push themselves, so as to dip down into it, carrying before them a portion of its thin wall, which constitutes a sheath to each tuft. In this manner, the whole interior of the placental cavity is intersected by numerous tufts of foetal vessels, disposed in fringes, and bound down by reflexions of the delicate membrane that forms its proper wall; just as the intestines are held in their proper places by reflexions of the peritoneum that covers them. This view was suggested to Dr. R. by the very interesting fact that the tufts of foetal vessels not unfrequently extend beyond the uterine surface of the placenta, and dip down into the uterine sinuses;

where they are still covered and held in their places by the same reflected membrane. The blood is conveyed into the placental cavity by the 'curling arteries' of the uterus; and is returned from it by the large veins, that are commonly designated as sinuses. The fœtal vessels, being bathed in this blood, as the branchiæ of aquatic animals are in the water that surrounds them, not only enable the fœtal blood to exchange its venous character for the arterial, by parting with its carbonic acid to the maternal blood, and receiving oxygen from it; but they also serve as rootlets, by which certain nutritious elements of the maternal blood, (probably those composing the liquor sanguinis,) are taken into the system of the fœtus. There is no more direct communication between the mother and fœtus than this; all the observations which have been supposed to prove the existence of real vascular continuity, having been falsified by the extravasation of fluid, consequent upon the force used in injecting the vessels. Moreover, the different size of the blood corpuscles in the fœtus and in the parent shows the non-existence of any such communication."

The *umbilical cord* connects the placenta with the abdomen of the fœtus, and is composed, during the early period of pregnancy, of the remains of the umbilical vesicle, of the omphalo-mesenteric blood-vessels, of the allantois and its pedicle, the urachus. When these parts have served their intended purposes, they dwindle into simple membranous bands, and the umbilical cord will then be found to consist, 1st. Of two arteries and one vein. The umbilical vein is destitute of valves; its walls are thin, and its calibre greater than that of the arteries. This vein arises from the placenta, and entering the abdomen at the umbilicus, it terminates at the umbilical fissure of the liver, in the way to be described hereafter.

The umbilical arteries, two in number, are the continuations of the hypogastric of the fœtus. The walls of these arteries are thick, resisting, and contractile. In the early months of pregnancy, these vessels run parallel with each other, but at birth, they have a twisted appearance, in the centre of which the vein is placed.

2d. A considerable amount of cellular tissue exists in the cord, which serves to bind the parts together.

3d. The cellular tissue of the cord is infiltrated with a viscous

fluid, termed the *gelatine of Wharton*, the amount of which greatly augments the size of the umbilical cord.

4th. The umbilical cord is covered by a layer from the amnion, and perhaps from the chorion. We have already said that there were two notions in regard to this ; and the decision as to whether the chorion lines the cord will depend upon the opinion adopted.

The length of the umbilical cord varies with the advance of pregnancy ; at birth it is usually as long as the fœtus itself ; in other cases it is much longer ; while in other rare instances, it is much shorter. The volume and toughness of the cord varies very much. When the cord is very long, it sometimes presents one or two knots.

Having now described all the membranes, &c., which are connected with the embryo, their arrangement will be easily comprehended by reference to fig. 11, and the accompanying explanation of the different parts, which is taken from Wagner.

SECTION II. *Fœtal Circulation*.—We have said that, when the placenta was formed, the veins of each cotyledon, being brought in contact with the uterine arteries, absorbed from them the blood destined to circulate through the fœtal body. The veins of the placenta all unite to form the umbilical vein, which forms a portion of the cord, and entering the abdomen of the fœtus at the umbilicus, passes to the fissure of the liver, where it divides into three branches, two of which are distributed to the liver, while the third, called the *ductus venosus*, carries the blood immediately to the *vena cava ascendens*. In some cases the *ductus venosus*, instead of terminating as first described, empties into one of the hepatic veins, just before its union with the *vena cava ascendens*. The blood of the umbilical vein, which was sent to the liver, after circulating through this organ, is collected into the hepatic veins, and empties into the *vena cava ascendens*, whence, with the blood from the *ductus venosus*, it is conducted to the right auricle of the fœtal heart. In the right auricle it meets with the blood from the descending *cava*, with which it is said to become mixed ; a portion of this mixed fluid passing into the right ventricle, while the other portion passes through the *foramen ovale* (an opening not yet closed) into the left auricle. The *foramen ovale* is an opening in

the *septum auriculorum*, which closes soon after birth, and which is said to be supplied with a valve, so arranged as to allow the passage of all the blood from the *vena cava ascendens*, into the left auricle, without any intermixture with the blood from the *vena cava descendens*. This is the generally received opinion, but whether it be true or not is not of much importance. It is only necessary to know that the two auricles become filled by blood from the *vena cava*, and contracting simultaneously, they drive the blood into both ventricles. In this way both ventricles are filled, and when they contract, which they do simultaneously, the blood of the left ventricle passes up through the aorta, &c., to supply the head and upper extremities. At the same time, the blood from the right ventricle has two directions, 1st, through the pulmonary arteries (which are small) to the substance of the lungs. 2d. That portion of blood which is not needed for the lungs, passes directly through the *ductus arteriosus* (which is a canal leading from the root of the pulmonary artery to the descending aorta) to the aorta, where it becomes mingled with the blood of the left ventricle, which was not required for the head and superior extremities. A part of the blood remaining after the head, upper extremities and lungs have been supplied, is distributed to the viscera and inferior extremities, while the remainder is forced into the umbilical arteries, which pass upward from the hypogastric arteries, to the umbilicus and thence to the placenta, where its renovation takes place. When the blood, distributed to the head and upper extremities, has served the purposes of nutrition, its remains are conducted through the veins, into the *vena cava descendens*, into the right auricle, &c. If this view of the circulation be true, it will be easily understood that the head and superior extremities are supplied with blood nearly as pure as that which returns from the placenta, while the viscera and inferior extremities receive that which has previously circulated through the system. At birth, the course of the blood is entirely changed, by the closure of the *foramen ovale*, which forces all the fluid entering the right auricle, from the ascending and descending *cava*, immediately into the right ventricle; thence, through the pulmonary arteries (which are much enlarged, while the *ductus arteriosus*

diminishes in size) into the lungs, where it undergoes those changes which result in the conversion of venous into arterial blood. The blood of the fœtus is of a dark colour like venous blood, assuming, on exposure to the air, the florid colour of arterial blood. Dr. Lee thinks it probable that the fluid which circulates through the umbilical vein, is rather more florid than that which is returned to the placenta, through the umbilical arteries. How is the fœtus nourished? This nutrition of the fœtus is probably effected by the absorption (by imbibition) of a fluid exhaled from the internal surface of the uterus, through the different membranes which surround the fœtus. The amniotic fluid is thus secreted, and as it is rich in albumen, there can be no doubt of its nutritive qualities. When within the amniotic bag, this fluid is taken up by the fœtus in two ways: 1st, by cutaneous absorption; 2d, by absorption through the intestinal canal.

Such is the principal means by which the fœtus is nourished, until the utero-placental circulation is fully established. When this is perfected, the blood absorbed by the placenta from the blood-vessels of the mother, no doubt contributes to the more rapid nourishment of the embryo. What change the placenta and liver produce in the blood is not as yet understood, but Dr. Lee says "the liver has usually been regarded in the fœtus as an organ auxiliary to the placenta, and in the adult to the lungs;" and he adds, "that according to the preceding view, absorption takes place in the placenta of certain nutritious matters from the maternal blood, which are carried along with the blood of the umbilical vein to the liver. It there circulates through the substance of this organ, that an albuminous or chylous fluid may be formed, and poured into the duodenum, there to undergo changes similar to those which are observed in adults."

SECTION III. Fœtal Head.—This is of an oval shape, and of the size to be mentioned hereafter. The cranial bones of the fœtus are soft; and instead of being united, as in the adult, by firm sutures, are separated from each other by a membranous space, which will serve as guides, in determining the position of the head in the pelvis. Owing to the existence of these membranous spaces, the cranium will bear some compression, and in fact,

in every delivery, the edges of the bones ride over each other to a certain extent, as can be determined by an examination per vaginam. These sutures are numerous; but we shall only mention those, a knowledge of whose direction will serve some useful purpose in ascertaining the position of the head.

1st. The Sagittal suture or commissure extends from the root of the nose to the superior angle of the occipital bone. It runs between the parietal bones and the two halves of the os frontis. The two portions of this bone become completely consolidated in adult life.

2d. The Coronal suture, which separates the os frontis from the parietal bones, extends from the point of the greater wing of the sphenoid bone of one side, to that of the opposite side.

3d. The Lambdoidal suture is shaped like the Greek letter *lambda*, and separates the superior edge of the occipital bone from the posterior edge of the two parietal bones.

In the fœtus, at the point where the superior angle of the occipital bone and the posterior superior angles of the parietal bones approach each other, a small membranous space of triangular form is observed, which is called the *posterior fontanelle*. This fontanelle is at the posterior extremity of the Sagittal suture. It is frequently wanting in the full-grown fœtus.

Where the anterior superior angles of the parietal bones, and the superior angles of the two halves of the os frontis approximate, a membranous space is to be found, which is termed the *anterior fontanelle*. Its shape is quadrangular, and it is much larger than the fontanelle just described.

In distinguishing between these fontanelles, their shape, their size, and the number of sutures which concur to their formation should be our guide. Accurate knowledge in regard to the fontanelles, and to the form and direction of the sutures, is of the utmost importance in ascertaining the position of the head in regard to the pelvis, and we would therefore impress upon the student the necessity of acquiring the most thorough information on this subject.

Size of the fœtal head. The following are the measurements of the full-grown fœtal head:

1. The *occipito-mental diameter*, which extends from the posterior fontanelle to the chin, measures five inches.

2. The *occipito-frontal*, which extends from the occipital protuberance to the centre of the forehead, measures from $4\frac{1}{4}$ to $4\frac{1}{2}$ inches.

3. The *cervico-bregmatic*, which extends from a point midway between the occipital protuberance and the occipital foramen, to the centre of the anterior fontanelle, measures $3\frac{1}{2}$ inches.

4. The *bi-parietal diameter*, extends from the centre of one parietal protuberance to that of the other, and measures $3\frac{1}{2}$ inches or more.

5. The *fronto-mental*, extending from the chin to the upper part of the forehead, measures from $3\frac{1}{2}$ to 4 inches.

6. The *post trachelo-frontal*, which extends from a point midway between the occipital protuberance and the occipital foramen, to the centre of the os frontis, measures from 4 to $4\frac{1}{4}$ inches.

7. The *præ-trachelo-occipital*, which extends from the hyoid-bone to the posterior fontanelle, measures about $3\frac{1}{2}$ or 4 inches.

In addition to the above measurements, we have the following:

1. The *bi-trochanteric diameter*, which extends from one trochanter to the other, measures $3\frac{1}{2}$ inches.

2. The *bis-iliac diameter*, extending from the crest of one ilium to that of the other, measures $3\frac{3}{4}$ inches.

3. The *bis-acromial diameter*, which extends from one acromial process to the other, measures $4\frac{1}{2}$ inches.

4. The *dorso-sternal diameter*, extending from the vertebral column through to the sternum, measures $3\frac{1}{2}$ inches.

The student should compare these diameters of the fœtus with those of the pelvis, in order that he may be able, when the occasion requires, to bring the large diameters of the former into correspondence with the long diameters of the latter.

CHAPTER VII.

SECTION I. *Pregnancy*.—When conception has taken place, the ovum is conveyed through the fallopian tube into the cavity of the uterus, and the female is termed pregnant, or in other words, the term of utero-gestation has commenced. In some cases the ovum, after vivification, instead of passing into the uterus, remains either in the ovary or in the fallopian tube, or in the abdomen, giving rise to different varieties of *extra-uterine* pregnancy. If, however, the ovum is conveyed to the cavity of the uterus, the pregnancy is termed *uterine*.

The following division of both varieties of pregnancy may be adopted. Uterine pregnancy may be,

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| 1. Simple or true pregnancy | { Where the uterus contains one or more fœtuses. |
| 2. False pregnancy | { Where the uterus contains a false germ, a mole, or hydatids. |
| 3. Mixed pregnancy | { Where the uterus contains both a fœtus and a mole, &c. |

Extra-uterine pregnancy is also divisible into several varieties :

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|--------------------------|--|
| 1. Ovarian pregnancy | { Where the vivified germ fails to reach the uterus, and is retained within the ovary. |
| 2. Abdominal pregnancy | { Where the ovum falls into the abdominal cavity. |
| 3. Fallopian pregnancy | { Where the ovum is retained within the fallopian tube. |
| 4. Utero-tubar pregnancy | { Where the ovum is retained partly within the fallopian tubes and partly within the uterine cavity. |

5. Interstitial pregnancy

} Where the germ becomes entangled within the interstices of the uterine fibres.

These varieties of extra-uterine pregnancy are exceedingly rare, and the existence of some of them is denied by some writers of the present day; still we have thought it best to acquaint the student with the use of terms frequently met with in medical works. Hereafter we will explain the anatomical nature of these anomalous forms of pregnancy, as well as the treatment necessary in each case.

It is very important that the physician should be perfectly familiar with all the symptoms of pregnancy, since cases frequently occur in which it is not only interesting but highly important, that the pregnant or non-pregnant condition should be positively determined.

The signs of pregnancy may be ranged under the heads 1st, the Rational Signs—2d, the Sensible Signs.

1. The rational signs are either *general*, *local*, or *sympathetic*. The *general effects* observed, in the system, on the supervention of pregnancy, are not *per se* of much positive value, though, when combined with other signs, they serve to strengthen the diagnosis, which is always difficult in the early months of pregnancy. The pulse of a pregnant female is increased in frequency and force, and the blood is said to be more plastic in its character, than under ordinary circumstances. The respiration is more rapid and usually accompanied by an increase in the temperature of the body. The activity of the secretions is also greater. The condition of the nervous system probably undergoes a greater change than any other portion of the animal economy. The moral condition of the female is changed, and sometimes morbidly perverted, those previously cheerful, become melancholy and peevish, and vice versa. The changes in this respect are so numerous, that it is impossible to enumerate them in a work so limited in its character as the present.

At the commencement of pregnancy, the constitution of the female becomes more liable to disease—constituting that *puerperal condition*, which, originating in conception, is developed during

pregnancy and increases at parturition, only ceasing when the female has recovered from the exhaustion consequent upon delivery.

Local Signs.—One of the most important, as well as the earliest, signs of pregnancy is evinced in the cessation of the catamenia. The occurrence of this circumstance must not, however, be regarded as an unerring sign of pregnancy, since it may often be due to functional or organic disease of the uterine system. At the same time, the presence of the catamenial discharge, will not indicate certainly, the non-existence of pregnancy, since it is clearly proved that some females menstruate regularly during the early months of pregnancy, while others are found to menstruate only during pregnancy. Many curious cases of this kind have been recorded by Dewees, Daventer, Baudelocque, and others. When the menses have suddenly disappeared, and their cessation is not attributable to cold or disease, pregnancy may be suspected if the female has had intercourse with the opposite sex. Where the female is married, the difficulty in diagnosis is usually lessened, but if she be unmarried, the case is rendered exceedingly uncertain, by the denial of improper intercourse. The physician should be very cautious in crediting the assertion of his patient on this point; at the same time, he should avoid injuring the character of an individual, unless conclusive testimony justify him, in so doing. The true course in these cases is to preserve a cautious reserve, till in the progress of pregnancy, the sensible signs render the diagnosis undoubted. In the determination of the diagnosis, the physician should avoid, where any doubt exists, the exhibition of any medicines, calculated to restore the suppressed evacuation.

Change in the Colour of the Vulva.—This change from the natural pinkish hue to a bluish colour, has been considered as indicating the existence of pregnancy; but as this change in colour seems to be due to impeded circulation, it may be produced by other causes than pregnancy, viz. tumours of the pelvis, &c. &c.

Change in the Colour of the Skin.—This is a sign of inferior quality; but where it exists, the skin becomes of a brownish-yellow colour. A case is related, in which the skin became dark, like that of a negro, soon after confinement.

Sympathetic Signs.—These are valuable adjuvants in summing up the points of diagnosis; but their existence, independent of the more important sensible signs, do not justify us in asserting that the female is pregnant.

Morning Sickness.—This nausea most usually, though not always, occurs in the morning, and is entirely independent of anything taken into the stomach. Its existence not being confined to pregnancy, is not a sign of positive importance.

Vomiting often, though not always, accompanies pregnancy; but, like the nausea above alluded to, may occur in other affections, and therefore is not reliable as a sign of pregnancy.

Anorexia is sometimes present, and may be accompanied by perversion of appetite, as is shown in the longing after articles not usually taken as food.

Ptyalism frequently exists, but is a symptom of but little positive value.

Anorexia, nausea, vomiting, and ptyalism may continue during the whole progress of pregnancy, but most usually they disappear after a few months. At least, this is true in regard to the nausea and anorexia, which are frequently succeeded by good appetite and good digestion.

The student must remember that the rational signs, whether general, local or sympathetic, are of but little importance, when unaccompanied by the sensible signs to be mentioned presently. In union with the sensible signs, they render the diagnosis positive and undoubted.

Sensible Signs.—*Enlargement of the mammae* is a frequent attendant upon pregnancy. The breasts become swollen, hard, and tender, very early in pregnancy, and in some cases this condition continues throughout the whole period of utero-gestation. In others, the tumefaction subsides about the fourth or fifth month, and is not reproduced until the end of pregnancy, or perhaps until after parturition. The glands of the axillæ sometimes become enlarged, but this is not always the case. In conjunction with enlargement of the breasts, the nipple undergoes an increase in size, and a fluid substance may be made to flow from its terminal ducts. The colour of the nipple becomes of a deeper red. These changes

in the nipple occur about the end of the second month, and it is at this time that the surrounding tissue assumes an emphysematous character, due, probably, to an increased afflux of fluids to the part.

As signs of pregnancy, enlargement of the mammæ and increased prominence of the nipple are exceedingly uncertain. The same changes may be produced by suppression of the catamenia, by uterine tumours, &c. On the other hand, pregnancy may exist without the occurrence of these changes.

State of the Areola.—The change in the colour of the areola has been considered by some as pathognomonic of pregnancy. Hunter and Smellie considered it a certain sign, so much so, that the former diagnosticated pregnancy in a female, whose hymen was perfect, simply upon the ground that the areola was changed in colour. A subsequent post-mortem examination verified the diagnosis. The value of this sign has undoubtedly been overrated, since it may appear, as a consequence of ordinary uterine irritation, while in some cases of pregnancy it does not exist. Dr. Dewees does not think it shows itself in simple suppression of the menses; but in this we think he is mistaken.*

In first pregnancies, it is a sign of considerable importance; but when the female has had more than one child, it is difficult to determine whether the change in colour of the areola is due to the previous pregnancy, or of the one, the diagnosis of which is under discussion. Again, the colour of the skin modifies the appearance of the areola, and in some cases renders the diagnosis difficult: thus Gooch says, that in women with dark hair and eyes, the discoloration is very distinct; but in blondes, it is so slight, that it is difficult to say whether it exists or not. In brunettes, the colour

* We have a case, now under treatment, of a young girl who has had suppression of the catamenia for eight or ten months. When we first saw her, the abdomen was enormously distended, the mammæ flaccid, the hymen perfect, and the areola of a dark brown colour. There was no pregnancy in this case; because, when the discharge of the fluid took place, as it did spontaneously at the umbilicus, the abdominal tumour disappeared, and no tumour of the uterus or ovaries could be detected through the abdominal walls. We do not deny that there may exist disease of some portion of the uterine system; but this point can only be determined by a future post-mortem examination.

remains fixed, and therefore can only serve as a diagnostic point in first pregnancies.

These are the objections to this sign of pregnancy ; but still it is of sufficient importance to justify the student in acquiring an accurate idea of the peculiar change that the colour of the areola undergoes, under the influence of pregnancy.

If the areola be examined shortly after impregnation, its colour will be changed from its natural pinkish hue to a deep brown. This change is more apparent in first pregnancies and in brunettes than in second pregnancies or than in persons of light complexion. At the same time that the discoloration of the areola occurs, the sebaceous glands, seated under the skin of the areola, become enlarged, giving to the part a rough uneven appearance. This last is a very valuable sign of pregnancy, much more so than the discoloration of the areola.

The changes in the size of the mammæ, in the discoloration of the areola, and in the enlargement of the sebaceous follicles, occur at different periods of pregnancy. Sometimes, immediately after conception, the areola becomes discoloured ; most usually, however, it does not take place so soon.

Secretion of Milk.—This is a sign of some importance, but even here we have anomalous cases, which tend to weaken its value. Thus Baudelocque asserts having met with it in a child eight years old, and Dewees says, that this secretion sometimes occurs in females not pregnant, but simply affected with suppression of the menses. Cases have been reported, where the secretion of milk was present in the male, showing clearly that it may occur independent of pregnancy. The following case is reported by Dewees : “ I once knew a considerable quantity of milk form in the breasts of a lady, who, though she had been married a number of years, had never been pregnant, but who at this time had been two years separated from her husband. She mentioned the fact of her having milk to a female friend, who from an impression that it augured pregnancy, told it to another friend as a great secret, who in her turn mentioned it to another friend, and thus after having enlisted fifteen or twenty to help them keep the secret, it got to the ears of the lady’s brother. His surprise was

only equalled by his rage, and in a paroxysm, he accused his sister, in the most violent and indelicate terms, of incontinency, and menaced her with most direful vengeance. The lady, conscious of her innocence, desired that I should be sent for forthwith, and insisted her brother should not leave the room, until I arrived. Some time elapsed before this could be accomplished, as we were several miles from each other, during the yellow fever of 1798. During the whole of this time she bore his threats and revilings with the most exemplary patience and silence. I at length arrived, and in the presence of her brother and a female friend, she informed me of what I have just stated, and said her object in sending for me was to submit to such an examination as I might judge proper to determine, whether she was pregnant or not. She would not permit her brother to leave the chamber, and I conducted the examination without his withdrawing. This thing turned out, as I had anticipated, from the history given at the moment of her previous health. I pronounced her not pregnant, and she died in about eight months after of phthisis pulmonalis, in which disease, the obstruction of the catamenia is not an unfrequent occurrence." From the above, it will be seen that the secretion of milk cannot be relied upon as a sign of pregnancy, unless it be accompanied by other signs of great value.

Enlargement of the Abdomen.—Though this is a constant concomitant of pregnancy, yet its frequent occurrence from other causes render it extremely fallacious as a sign of the pregnant state. Ascites, disease of the ovaries, or uterus, or any abdominal tumour may be mistaken for enlargement from pregnancy, and unless some more certain signs are present, the physician would not be justified in drawing a conclusion from this circumstance alone. The following interesting case is recorded by Dewees, showing that retention of the catamenia may produce an enlargement similar to that occurring in pregnancy. "The young lady's case had been submitted to a medical gentleman, who from its history and the feel of the abdomen pronounced it to be a case of pregnancy. The history of the case was thus briefly given by the mother; her daughter commenced between twelve and thirteen to menstruate, and continued to do so regularly until late last fall;

at which time she had a very smart attack of the prevailing epidemic ; of this she was relieved by the usual remedies, since that time she has never menstruated ; she gradually swelled in the belly ; her stomach was much affected, especially in the morning, and the breasts were a little enlarged. I examined the mammæ and found them a little tumid, but without areolæ ; the abdomen was much enlarged, tense, and hard, in consequence of a large tumour which was confined to the left side of this cavity, and which could be easily traced throughout its right and inferior margin, and proved, (at least in my opinion,) to be an enlarged spleen. No tumour was found in the pubic region ; consequently the uterus was not found enlarged ; the navel was sunk ; and upon an attempt to pass the finger into the vagina, I found so much evidence of her continency that I did not persevere, being perfectly satisfied from the condition of the parts that she was a virgin. I unhesitatingly, and with no common degree of pleasure declared the poor child to be free from the charge so heedlessly and cruelly preferred against her."

Having given the sympathetic physical signs of pregnancy, we must examine *the changes which the uterus undergoes during the progress of pregnancy*. When an examination is made per vaginam, soon after the commencement of pregnancy, the cervix uteri becomes changed in consistence, volume, form and situation. The consistence of the neck of the womb, in the unimpregnated condition, resembles that of a fibrous tissue ; but soon after conception, the part becomes congested and softer than usual. Towards the end of the first month, the inferior portion of the neck is rendered very soft ; but the ramollissement seems confined to the mucous tissue covering the cervix. At the end of the third month, the ramollissement has extended itself to the lower portion of the proper tissue of the cervix, and advances gradually upward, so that at the sixth month one-half of the neck has undergone this curious change. During the last three months, the whole cervix has been softened, and at this time it is difficult to distinguish it from the walls of the vagina itself. This is one of the earliest signs of pregnancy, and when the touch has been well exercised, it affords us an indication of the greatest importance. The pro-

gress of the ramollissement is always from below, upwards, and is less rapid in primiparæ than in those who have borne many children.

The volume of the cervix is changed soon after impregnation. This increase in size is due to the congestion of the neck. The length of the neck is not increased, nor does it undergo diminution from above, downward, after the fifth month of pregnancy. This error, propagated by so many writers, has been exposed by M. Stoltz and others, who maintain that *the cervix retains its ordinary length until within a fortnight of the termination of uterogestation, when its diminution progresses rapidly, until the effacement has become complete.* In the primiparæ, this shortening of the neck commences somewhat sooner than in multiparæ, but the effacement does not begin at the superior extremity of the cervix, since the internal orifice remains closed until within a few days of labour. The mechanism of shortening, in these cases, has been explained as follows by M. Cazeaux, who says that "about the seventh month, the ramollissement has involved the whole extent of the vaginal portion of the cervix—the walls of the neck having lost their consistence, become separated by the liquids secreted upon their internal surface. The superior part of the vaginal portion is enlarged, so as to give to the whole cervix the form of a spindle, the superior and inferior extremities of which are formed by the internal and external orifices of the cervix. The external orifice, as we will presently see, is scarcely open, in the primiparæ, until the end of pregnancy." The form of the cervix undergoes some change during the progress of pregnancy, and this change varies with the number of children to which the female has given birth. In primiparæ, the inferior extremity of the cervix is at first rendered more pointed, and its orifice assumes a circular shape, about as large as a small pea. As the pregnancy advances, the middle portion of the neck becomes enlarged, but both orifices still remain closed. The external surface is smooth and soft, while its external orifice is round and smooth, entirely destitute of those inequalities which characterize the os uteri of those who have borne many children.

In multiparæ, the os uteri is widely opened even before preg-

nancy, and its circumference is rendered rough and unequal by the laceration of its fibres during previous deliveries. As pregnancy advances, this inferior orifice becomes more open, and its effacement and ramollissement gradually progresses from below, upwards, until at the end of utero-gestation, the whole neck has become effaced. The internal orifice remains closed until within a few days of parturition. In some rare cases, this orifice is dilated much sooner.

The conclusions to be drawn from this are as follows: 1st. The tissue of the cervix becomes softened at the commencement of pregnancy. The ramollissement, not very apparent at first, progresses gradually from below, upwards, until the whole cervix has become involved. The change is more rapid in multiparæ than in primiparæ. 2d. The cavity of the cervix dilates as the ramollissement advances. In primiparæ, the neck assumes the form of a spindle, while in multiparæ its form resembles that of a thimble, with the small extremity turned upward. 3d. The external orifice of the cervix remains firm till the close of pregnancy, in those who have never borne children. In multiparæ, it is sufficiently open to admit the extremity of the finger during the whole course of pregnancy. 4th. The whole cervix is effaced during the last fortnight of utero-gestation, so that it may be said to preserve its ordinary length until this period of pregnancy.

The situation of the cervix uteri also is changed, and its position varies much with the advance of pregnancy. During the first three months, it descends lower in the vagina, and is thrown forward under the symphysis pubis. After this period, the uterus rises up above the pelvic brim, and at the same time that the length of the vagina is increased, the os uteri is thrown back, towards the promontory of the sacrum. At an advanced period of pregnancy, if the pelvis be large, the head, when it presents, descends into the excavation, pushing before it not the cervix, but that portion of the uterine walls, which lies between the cervix and the symphysis pubis.

The above remarks, taken principally from the work of M. Cazeaux, seem to us to explain more satisfactorily the changes which the cervix uteri undergoes during pregnancy, at the same

time that they afford valuable information as to the diagnosis of the existence of pregnancy.

Changes in the Uterus.—These may be ascertained by examinations, either per vaginam, or per anum, or by exploration through the abdominal parietes.

During the first and second month of pregnancy, but little information can be obtained. The neck of the womb is softer than usual, and its mouth instead of being elevated and directed towards the sacrum, is low in the vagina, and looks towards the pubis. This change in the position of the os uteri is of course accompanied with a change in the position of the fundus, which is thrown towards the hollow of the sacrum. The uterus is heavier and less movable than usual, and by pressing with one hand above the pubis, and the other in the vagina, its volume will be found slightly increased.

At the termination of the third month, the uterus is firmly fixed within the pelvis, and rises a little towards the hypogastrium. The direction of its long diameter is changed, and gradually assumes that of the axis of the superior strait of the pelvis. If we attempt now to draw the cervix uteri towards the pubis, it will be found not only difficult, but impossible, unless the neck should bend under the effort—in which case, the position of the body of the organ would not be changed. The uterus may be elevated or depressed, but its lateral motion is nearly destroyed. At this time, it is impossible to make the finger in the vagina pass between the body of the uterus and the pubis, so as to touch the hand placed over the hypogastrium.

During the fourth month, the uterus has become much enlarged, and its fundus may be felt about three inches above the symphysis pubis. The cervix is not shortened, but is more elevated in the pelvic excavation. Obscure fœtal movements are now felt.

During the fifth month, the uterus is much increased in size, and its fundus has risen to within two inches of the umbilicus. The cervix is not shortened at this time, as is usually supposed, but is so elevated as to render its exploration per vaginam somewhat difficult. The vagina, of course, is lengthened, and is also diminished in width. The inequalities of the fœtus may now be

felt through the abdominal walls, and it is at this time that the fœtal movements, the bruit placentaire, the bruit du cœur, and ballottement may be distinguished.

During the sixth month of pregnancy, the fundus uteri has risen an inch above the umbilicus, and the sensible signs of pregnancy to be described presently acquire positive value. The navel now protrudes, and one half of the cervix is softened, though its shortening has not yet commenced.

During the seventh month of pregnancy, the fundus uteri is situated about two and a half inches above the umbilicus; the muscles of the abdomen become tense and painful. The cervix uteri is much softened, and all the sensible signs may be accurately distinguished.

During the eighth month, the fundus uteri occupies the epigastric region. No other change has taken place.

During the ninth month, the fundus uteri sinks to nearly the point at which it was at the seventh month of pregnancy. The cervix is completely softened, and, during the last fortnight of the ninth month, becomes completely effaced. The sensible signs are more easily distinguishable.

This is a description of the usual effects produced on the uterus by pregnancy. It must not be supposed, however, that the changes in these cases are always so regular and uniform—thus the uterus will rise more rapidly in narrow pelves, than where the excavation is contracted. Again, the neck yields sooner in some cases than in others.

The developement of the pregnant uterus may be confounded with many diseases, such as scirrhus or fibrous tumours, hypertrophy, uterine dropsies, &c.; also with enlargement of the ovaries. This difficulty only occurs at the commencement of pregnancy; for when time is given, there can be little difficulty in making out the diagnosis, especially since the uterine developement in pregnancy is much more regular and uniform, than where the enlargement is due to disease.

Movements of the Fœtus.—These occur at the end of the fourth or the commencement of the fifth month of pregnancy, and continue throughout pregnancy. The force and frequency of these

motions will depend upon the character of the fœtus. The first movements are felt above the pubis, most usually either after going to bed or immediately before rising in the morning. A female may be deceived in the perception of the fœtal movements, though she may have borne many children.

These movements are modified or retarded by the strength of the fœtus, by the quantity of liquor amnii, and by the sensibility of the uterus. Some very sensitive females assert that they have felt the fœtal motions as early as the third month; while others, less sensitive, do not experience them till the fifth, sixth, or even seventh month. M. Moreau considers the most usual period about the 110th day of pregnancy.

By applying the hand, made cold by dipping it in a basin of cold water, over the abdomen, the physician may determine the existence of these movements. The motion of the fœtus in utero, is a positive sign of pregnancy; but its absence does not prove the non-existence of this condition, since no movement would be perceived where the fœtus was dead, and its detection would be exceedingly difficult where it was feeble in strength. The first motions of the fœtus afford us no definite idea as to the advancement of the pregnancy.

Ballottement.—This is a passive movement of the fœtus, obtained by placing one hand over the hypogastrium, while the finger of the other, introduced into the vagina, must force up suddenly the presenting portion of the fœtus, which will be found resting on that portion of the uterus comprised between its cervix and the symphysis pubis. This movement is dependent upon physical causes, so that when the impulse is suddenly and quickly given to the presenting portion of the fœtus, by the finger in the vagina, the movement is felt by the hand placed over the abdomen. The fœtus, thus elevated, will, by its own weight, return to its original position, giving the idea of a body falling upon the extremity of the finger introduced into the vagina.

Ballottement is a valuable sign of pregnancy, being equally applicable to the dead as the living fœtus. We do not think we would go too far in asserting that it is *pathognomonic of pregnancy*, for we can hardly imagine its production by any other

cause than the presence of the foetus in utero. This has, however, been denied by some writers.

Ballottement makes its appearance about the fourth or fifth month of utero-gestation, and continues sometimes throughout the whole term. It, however, becomes indistinct when the foetus becomes large in proportion to the amount of liquor amnii contained within the uterus. It is best obtained when the female is in the erect position.

The next class of sensible signs to be considered are those derived through the *sense* of *audition*. In cases of pregnancy, if the ear be applied over the abdomen, two distinct sounds will be heard, one the *bruit de souffle*, the other the beating of the foetal heart.

The sound of the foetal heart was first noticed by M. Mayor, of Geneva, but had fallen into disuse, as a means of diagnosis, when M. Kergaradec called the attention of the profession to the two sounds above alluded to. The *bruit de souffle* or *placentaire*, is first heard about the fourth or fifth month of pregnancy, and resembles the sound heard over the arteries of chlorotic females; over aneurismal tumours and in some affections of the heart.

M. Jacquemier found that this sound was present in sixty-two cases out of two hundred and fifty-seven females who had not been delivered, and in twenty-three out of one hundred and thirty after delivery.

The *bruit de souffle* is a blowing sound, synchronous with the pulse of the female, and is usually heard low down upon the sides of the abdomen. At other times, the sound may be distinguished over a large extent of surface. During labour, the *bruit de souffle* may be easily distinguished, at the commencement of the pain, but when the contraction is increased in force, the distinctness of the sound diminishes, to be renewed again when the pain subsides. To what is this sound to be attributed? This is a question about which there has been much dispute, and even now the point is not settled. By some, it is supposed to be due to the peculiarity of the utero-placental circulation. This opinion cannot be correct, since the existence of the sound has been detected soon after delivery. Dubois, comparing the circulation between the arteries and veins of

the uterine parietes, to that of a varicose aneurism, asserts that this bruit de souffle is identical with that distinguished by the ear, when placed over an aneurismal tumour of this kind. This opinion is strengthened by the fact, that the sound may be heard with equal distinctness over any portion of the abdominal tumour, and that its distinctness varies with the degree of uterine contraction. By others, this sound has been attributed to the pressure of the gravid uterus upon the large arterial trunks in the neighbourhood of the brim of the pelvis. That this is one of the causes cannot be doubted, for the following reasons. 1st. The sound is synchronous with the pulse of the mother. 2d. It commences only where the uterus has arisen above the pelvic brim. 3d. It is heard most frequently over the course of the iliac arteries—usually over the right side, since the right lateral obliquity is most common. 4th. If a female be placed on her knees and elbows, so as to relieve the arteries from the pressure of the uterine tumour, the sound ceases to be heard.

These are the principal theories, (with various modifications,) of the origin of this sound; and we think the whole phenomena connected with sound, may be explained by adopting an opinion, that it is due, both to the pressure of the uterus upon the arteries, and to the peculiarity of the circulation in the uterine walls.

As a sign of pregnancy, it has not a positive value; because its occurrence is not constant, and when it exists it may be due to other causes than pregnancy, viz. tumours in the abdomen, aneurism, &c.

Pulsation of the fetal heart.—It has not the blowing sound of the bruit de souffle, but resembles the ticking of a watch, and beats as rapidly as one hundred and twenty-five, or fifty, in a minute. The foetal pulsations cannot be heard during the first months of pregnancy, owing to the feebleness of the heart's action and the large amount of liquor amnii which surrounds the foetus. Between the fourth and fifth months it is first observable, and even at this period, its distinctness will be much modified by the amount of waters, by the position of the foetus, and by its muscular strength. According to M. Jacquemier, its frequency of occurrence was two hundred and one times in two hundred and twelve cases. Where the ear of the auscultator is very accurate, it may be heard in al-

most every case, provided the child be living. M. Bodson thinks it would serve as a valuable sign of the progress of labour, and in some cases a knowledge of this sound will aid us in determining the life or death of the child, which, in cases of difficult parturition, it is often important to ascertain.

The presence of the fœtal pulsations, is a positive sign of the existence of pregnancy, but its absence does not prove that the female is not pregnant, because the child may be dead, or feeble, or surrounded by an undue amount of liquor amnii, or its position may be unfavourable to the transmission of the sound to the ear of the auscultator.

The presence of twins, it has been thought, might be determined by the existence of two distinct fœtal pulsations. On this point there is so much uncertainty, that no reliable opinion can at present be given.

The existence of *kiesteine* in the urine, has been supposed to indicate pregnancy. This *kiesteine*, which is supposed to consist of a gelatino-albuminoid material, was first described by M. Nauche, in 1831, and was supposed by him to be peculiar to the pregnant woman. It is described by this gentleman, as consisting of a number of small specks or oblong filaments, which unite in a pellicle of a line in thickness upon the surface of the urine. Some portion of this substance gradually sinks to the bottom of the vessel, containing the urine, and *there* forms a deposit of a white, milky appearance.

This subject has been fully investigated since the appearance of the pamphlet of M. Nauche.

Dr. E. K. Kane, of this city, has written an excellent pamphlet upon the subject, and from his experiments, he has drawn the following conclusions:

“1. That the *kiesteine* is not peculiar to pregnancy, but may occur whenever the lacteal elements are secreted without a free discharge at the mammæ.

“2. That though sometimes obscurely developed and occasionally simulated by other pellicles, it is generally distinguishable from all others.

“3. That where pregnancy is possible, the exhibition of a clearly

defined kiesteinic pellicle, is one of the least equivocal proofs of that condition ; and

“4. That when this pellicle is not found in the more advanced stages of supposed pregnancy, the probabilities, if the female be otherwise healthy, are as 20 to 1 (81 to 4) that the prognosis is incorrect.”

For further details upon this interesting subject, we would refer to the Essay of Dr. Kane, published in the American Journal of Medical Sciences for the year 1842.

From this review of the signs of pregnancy we may draw the following conclusions :

1st. That none of the rational signs are alone sufficient to prove the existence of pregnancy, but when taken in connexion with the sensible signs, they serve to strengthen the diagnosis.

2d. That the active movements of the fœtus are not to be taken as proof positive of the existence of pregnancy, because both physician and patient may be deceived as it regards their positive existence ; *the one* by the artifice of the female, and *the other* by her imagination.

3d. That the signs furnished by the sight and touch are insufficient to establish the existence of pregnancy.

4th. That of the signs furnished by audition, the pulsation of the fœtal heart, when it exists, may be taken as proof positive of the pregnant state.

5th. That of all the signs, that of ballottement is most valuable, and is pathognomonic of pregnancy. It exists whether the fœtus be dead or alive, and is therefore more valuable than the sound of the fœtal heart. Some have supposed that certain uterine tumours might give rise to ballottement, but we can hardly suppose this possible.

6th. That kiesteine is not pathognomonic of pregnancy, being rather an indication of the existence of a secretion of milk from the mammary glands.

In imitation of M. Cazeaux, we arrange the following synoptical table, to which the student may refer as furnishing a *resumé* of the various signs of pregnancy, at the different periods of advancement.

RATIONAL SIGNS.

SENSIBLE SIGNS.

During the First and Second Months.

1. Suppression of the catamenial discharge.

2. Nausea, vomiting, ptyalism, anorexia, &c.

3. Unnatural flatness over the hypogastrium.

4. Tumefaction and tenderness of the mammæ.

1. Increase in the size and weight of the uterus.

2. Slight prolapsus of the uterus.

3. Diminished mobility of the uterus.

4. The cervix uteri is directed towards the symphysis pubis.

5. The os uteri round and regular in primiparæ, but in multiparæ, irregular in its circumference and more or less open.

6. Ramollissement of the mucous membrane, covering the cervix uteri. The fibres of the neck not yet softened.

During the Third and Fourth Months.

1. Suppression of the catamenia.

2. Continuance of nausea, vomiting, anorexia, ptyalism.

3. Slight prominence over hypogastrium.

4. Depression of the umbilicus.

5. Tumefaction of the breasts increased, with increase in the prominence of the nipple, and a slight discoloration of the areola.

6. Kiesteine in the urine.

1. The fundus uteri elevated rather above the pelvic brim, at the end of the third month. At the termination of the fourth month, it rises two inches above the pubis.

2. Fulness and dulness over the hypogastrium.

3. Existence of a small tumour in hypogastric region.

4. The direction of the long diameter of the uterus is now changed, so as to correspond with the axis of the pelvic brim.

RATIONAL SIGNS.

During the Fifth and Sixth Months.

1. Suppression of the catamenia.

2. Cessation of nausea, vomiting, &c., now usually takes place, though they may continue throughout pregnancy.

3. Increased prominence of the umbilical region.

4. The size of the abdominal tumour is increased, it is round, elastic, and if the abdominal walls be thin, the inequalities of the fœtus may be felt.

5. The umbilical region more full.

6. Discoloration of the areolæ more marked, with an enlargement of the subcutaneous glands.

7. Kiesteine in the urine.

SENSIBLE SIGNS.

The os uteri is considerably elevated in the excavation.

5. Ramollissement of the inferior portion of the cervix is more marked; os uteri more open in the multiparæ, but still closed in those who have not borne children.

1. At the end of the fifth month, the fundus uteri is within an inch of the umbilicus.

2. Movement of the fœtus is now active.

3. The bruit de souffle and the fœtal pulsations may now be distinguished.

4. Ballotement.

5. Between the cervix and the pubis a tumour may now be felt, either soft and fluctuating, or round and hard.

6. Ramollissement of one half of the cervix uteri.

7. In the primiparæ, the os uteri is still closed, but in the multiparæ, it is sufficiently open to admit the half of the first phalangeal bone.

During the Seventh and Eighth Months.

1. Suppression of the catamenia.

2. Nausea, vomiting, &c. ordinarily absent.

1. Increase in the size of the abdomen.

2. The fundus uteri, at the end of the seventh month, has

RATIONAL SIGNS.

3. Abdominal tumour much increased in size.

4. Pouting of the navel.

5. Increased discoloration of the areolæ, with enlargement of the sebaceous follicles, and increased prominence of the nipple.

6. The milk may now be pressed from the swollen mam-mæ.

7. Kiesteine still exists in the urine.

SENSIBLE SIGNS.

risen two and a half inches above the umbilicus; at the eighth, it is placed within the epigastric region.

3. Active movement of the fœtus.

4. The fœtal pulsations and the bruit de souffle still continue.

5. Ballottement perfectly felt during the seventh month, becomes obscure in the subsequent months of pregnancy, on account of the increase in the size of the fœtus.

6. The ramollissement of the cervix is more extensive, and at the end of the eighth month is nearly complete.

7. In the primiparæ, the cervix is ovoid and somewhat shortened; the os uteri is still closed.

8. In the multiparæ, the os uteri is wide enough open to admit the whole of the first phalangeal bone; the upper orifice is firmly closed.

During the first half of the Ninth Month.

1. Re-appearance of vomiting, not from nausea, but from pressure of the gravid uterus against the stomach.

2. The abdominal tumour is increased in size.

3. Respiration difficult.

1. The fundus uteri occupies the epigastric region.

2. The movements of the fœtus; the pulsation of the fœtal heart are still present. At this time, ballottement has disappeared.

RATIONAL SIGNS.

4. All the other symptoms are augmented in intensity.

SENSIBLE SIGNS.

3. The whole cervix uteri is softened, except the internal orifice, which remains firm and closed. The os uteri in primiparæ is slightly opened, though not sufficiently to admit the finger, as is the case in multiparæ.

During the last half of the Ninth Month.

1. The vomiting ceases, as the abdominal tumour sinks from the epigastrium.

2. Respiration less oppressed.

3. Considerable difficulty exists in walking, owing to the sinking of the presenting part into the pelvic excavation.

4. Constant desire to evacuate the bladder and rectum.

5. The hemorrhoids, the œdema of the limbs and the varicose condition of the veins of the inferior extremities are all increased.

1. The fundus uteri has sunk lower down in the abdomen.

2. The sensible signs still persist, except ballottement, which is usually, though not always, absent after the fœtus has acquired considerable size.

3. In multiparæ, the internal orifice of the cervix is softened and dilated, so that the membranes may be felt. In the primiparæ, the internal orifice is soft and dilated, but the external remains partially closed. During the last ten or twelve days, owing to the dilatation of the internal orifice of the cervix uteri, the whole cervix becomes enlarged, so as to increase the size of the uterine cavity; so that *in touching*, the finger reaches the membranes, in the primiparæ, after having passed the thin and even margin of the os uteri. While in the multiparæ, the external orifice of the cervix is thick and unequal.

SECTION II. *The Development of the Uterus during Pregnancy.*—Having now considered the developement of the ovum, from the moment of conception to the end of pregnancy, we must see what are the changes, which take place in the uterus, during the progress of utero-gestation. In the early periods of pregnancy, the tissue of the uterus becomes softer and thicker than it was previously. Its fibrous structure is rendered apparent, and nothing proves more conclusively that the bulk of the organ is increased, during pregnancy, than the two following facts. 1st, the virgin uterus of an adult only weighs about one twenty-fourth of that of the gravid uterus at full term, when its contents have been taken from it. 2d, after delivery, the walls of the uterus are, for a time, found to be at least an inch thick, provided, the organ has undergone that degree of contraction which is usual in such cases.

But not only does the bulk of the organ increase, but its size, as we shall presently see, changes greatly.

With these preliminary observations, we will pass to the consideration of the changes which take place in the uterus at the different periods of pregnancy, inasmuch as many questions in medical jurisprudence are involved in its discussion.

During the first month of pregnancy, but little change is appreciable in the uterus. The organ is somewhat increased in size, from an increase in the amount of blood contained within its parietes. The vaginal portion of the cervix is softer to the touch than in the unimpregnated state, when it is hard and cartilaginous. This condition of the cervix is one of the earliest signs of pregnancy obtained by a tactile examination of the organ. The os uteri is changed as it regards its orifice; the transverse slit of which becomes more oval in its form.

The form of the uterus is not sensibly changed during the first month, but its position is not the same as in the unimpregnated state, for its fundus is inclined backward, towards the hollow of the sacrum, while the os uteri is nearly in the centre of the pelvis. This position is maintained as long as the uterus remains within the pelvic excavation, viz. until the end of the third month.

During the second month, the os uteri may be felt somewhat lower down in the pelvis. The size of the organ is somewhat in-

creased, presenting around its cervix, the same soft feel we have just mentioned. The orifice of the os uteri is smooth and circular in the primiparæ, but in the multiparæ, it is rough and sufficiently open to admit the end of the finger. This roughness is due to the laceration of the fibres of the os uteri during the delivery of the child. In the primiparæ, the os uteri remains closed until the end of pregnancy.

During the third month, the uterus is found somewhat enlarged in its fundus, and at times this protrudes above the pelvic brim. The os uteri is not so easily reached at this time, owing to the elevation of the organ towards the abdomen. As this elevation advances, the position of the uterus changes, so that its fundus inclines forward, while the os uteri is turned backward towards the hollow of the sacrum.

The form of the uterus is not yet much changed; but as *its* increase in size, during the early months of pregnancy, *is effected entirely at the expense of the body of the organ*; the form bears a great resemblance to that of a gourd.

During the fourth month of pregnancy, the fundus uteri is found still more enlarged, and may now be felt two or more inches above the symphysis pubis. The os uteri is now directed backward towards the sacrum, and is with difficulty reached, owing to the great elevation of the organ. The elevation of the uterus is due, 1st, to the enlargement of the fundus; 2d, as the organ increases in size, the space in the pelvic cavity becoming too small, it slips above the superior strait.

When the uterus has risen into the abdomen, it is subject to several deviations, 1st, a lateral obliquity, either to the right or left, most usually the former,—2d, an anterior obliquity,—3d, Moreau mentions a deviation of rotation, by which the anterior and posterior face of the uterine globe become lateral, while the lateral surfaces become anterior and posterior.

Meckel, in his observations on fourteen gravid uteri at different periods of utero-gestation, states, that the parietes of the organ become thicker during the first, second, and third month; but after this, they gradually become thinner, up to the full time. At the end of gestation, they are thicker at the fundus than at the lower portion of the organ. The walls of the uterus, at the fifth month of pregnancy, are about the same thickness as in the normal con-

dition. At full term, the thickness of the walls is greater at the point where the placenta is attached, than in the unimpregnated condition; but at its lower portion, the thickness is less than where pregnancy does not exist.

During the fifth month, the fundus goes on enlarging, and may now be felt more than half way between the symphysis pubis and the umbilicus. The elevation of the os uteri is still greater, and its position still directed backward.

During the sixth month, the fundus uteri is found as high as the umbilicus. The form of the organ is now globular, and the presenting portion of the child may be felt through that portion of the uterus, lying between the cervix and the symphysis pubis. It is asserted by some writers, that the neck of the womb begins to shorten at this period, and continues to do so until the end of uterogestation. In a virgin uterus, Mad. Boivin states the length of the cervix to be about half an inch, while the length of the cervix in the unimpregnated uterus of those who have previously borne children, is as much as one inch. According to this writer, the cervix, at the sixth month of pregnancy, has lost about one-third of its natural length.

These views of the mode in which the neck of the uterus becomes effaced, are not in accordance with those expressed by M. Cazeaux. In another place we have explained the views of M. Cazeaux, and have at the same time expressed our belief in their correctness.

During the seventh month, the fundus uteri rises two inches above the umbilicus. The form of the uterus is globular, and its position remains the same as at the sixth month.

During the eighth month, the organ is found to have risen more than half way between the umbilicus and the serobiculus cordis. The os uteri is very high up, and this occasions a lengthening of the vagina, at the same time that its width is much diminished.

During the ninth month, the fundus uteri has risen as high as the epigastrium. This extreme elevation of the fundus uteri occasions great oppression of breathing; greater in primiparæ than in those who have borne children. The uterus is spherical in its form, and that portion of it placed between the cervix uteri and the symphysis pubis, is more dependent than the os uteri itself. The os uteri now becomes effaced in the way already described.

As the tissue of the uterus becomes more and more developed, the blood-vessels and nerves become very much increased in size. The increase in the size of the nerves, was first pointed out by Hunter, but the subject has been more thoroughly investigated, of late years, by Dr. Robert Lee, of London, to whose valuable work we would refer the reader.

As the tissue proper of the uterus becomes developed, we find that the direction of its fibres is more capable of demonstration, and may be arranged under two heads; 1st, its longitudinal fibres; 2d, its transverse fibres.

SECTION III. Some of the symptoms of pregnancy become occasionally so harassing to the patient, as to require medical treatment on the part of the practitioner. No class of diseases requires, more discrimination, since officious interference or injudicious neglect, will equally affect the well-being of the mother and of the fœtus in utero. We propose in the present chapter, to point out the circumstances, under which the different symptoms of pregnancy will become objects of medical treatment, as well as the remedies appropriate in each case.

Ptyalism.—The secretion of the salivary glands is much increased during pregnancy, but in most cases, this is not productive of injury to the female. Where, however, the discharge becomes excessive, or irritating from its acid qualities, it should be arrested by the employment of proper remedies. In these cases, the danger is from the debilitating effects of a constant drain upon the system, as well as from the irritating influence of an intensely acid secretion from the stomach, with which it is usually accompanied. Alkaline substances, combined with laxatives, should be prescribed for the purpose of neutralising the acid secretion, at the same time that the bowels are kept in a soluble condition. Dr. Dewees advises rinsing the mouth frequently with lime water, and recommending the patient to resist the desire of discharging the saliva from the mouth as much as possible. This sympathetic affection most usually disappears about the fifth or sixth month of utero-gestation.

Anorexia and disgust for ordinary articles of food, with a desire for substances of an unusual character, are a frequent attendant upon pregnancy. Where these symptoms exist in an excessive degree,

the peculiarities of the patient's taste should be consulted, as far as such a thing is practicable. If plethora exist in connexion with these symptoms, a moderate bleeding may be of service. On the other hand, if symptoms of debility are present, tonics may be required. In some cases, diarrhœa occurs, and this must be treated upon ordinary principles.

Vomiting.—This is occasionally exceedingly distressing to the female, and unless some effectual remedy be employed, is apt to reduce the patient to a very debilitated condition. It is proper to distinguish the two varieties of vomiting which occur during pregnancy; the first occurs during the early months of pregnancy, and is due to sympathetic action; while the second makes its appearance during the latter months, and is dependent upon the pressure of the gravid uterus upon the stomach. This last variety is to be relieved not by medicines, but by recommending the patient to take her food in small quantities at a time, so that the stomach will not at any time be unduly distended.

Where the vomiting is dependent upon sympathy, it usually ceases after the first three or four months of pregnancy, and in ordinary cases, is confined to the evacuation, early in the morning, of a thick, colourless fluid, frequently possessing acid properties. At other times, the vomiting continues throughout the day, but more especially after meals, when the whole contents of the stomach are expelled. In this case, no food is digested, the emaciation and debility of the patient will become extreme, unless the vomiting is soon arrested. Independent of the fact that all the food taken into the stomach is thrown up, the very act of vomiting may of itself produce great injury to the mother, by inducing a premature discharge of the uterine contents.

The vomiting in some few cases is accompanied by considerable pain in the stomach, but in those cases which have been examined after death, no sign of any organic lesion has been discoverable.

When the vomiting is slight, the use of some aromatic infusion will be found sufficient to produce relief. Should acidity exist in these cases, some alkaline substance may be employed in connexion with the aromatic infusion.

If the vomiting occur after eating, every attempt should be made

to discover, what variety of food best agrees with the stomach. Upon this point, no fixed rule can be laid down, since that which is applicable to one case, would be inappropriate in another. When no food will stay on the stomach, a small pill of opium should be prescribed immediately before meals, at the same time that every attention is paid to keeping the bowels regular.

When much pain exists, opium will be found very useful, though great caution must be used in its employment. If plethora exists, the use of opiates is contraindicated, and a small bleeding from the arm will be serviceable.

If the vomiting be excessive, and none of the above remedies succeed in arresting it, small quantities of milk and lime water may be employed, at stated intervals of time. In these cases, counter-irritants over the epigastrium may become of very essential service.

Where much acidity exists, the employment of antacids may be resorted to, but where they fail to arrest the acid secretion, Dr. Dewees says: "I recommend the use of acids for the relief of this most distressing state of the stomach. Both vegetable and mineral acids have been employed by me, with perhaps about equal success; but the vegetable will merit the preference in general, on account of the teeth. I have in several instances, confined patients for days together, upon lemon-juice and water, with the most decided advantage." The same writer recommends the use of spirits of turpentine, in twenty-drop doses, three or four times daily, when the system is not excited to febrile action. When the vomiting is so excessive as to threaten the life of the patient, it may become necessary to resort to premature delivery.*

* To relieve vomiting, in these cases, we may resort to the following prescription.

R.—Spirit. juniperi compos. ʒvj.	Or if acidity be also present, the following:
Creasoton gtt. j.	R.—Subnitrat. bismuth. gr. x.
Syrup. aurantii ʒi.	Testæ præparat. gr. xx.
M. sig. A teaspoonful to be taken every half hour.	Pulv. colombee gr. xx.
	Pulv. Zingiberi gr. xxx.
	M. et divide in chart. No. xij. Sig.
	One to be given every two hours.

Heartburn.—This affection must be treated with aromatics and antacids. The following formula of Dr. Sims will be found serviceable :

R.—Magnesiæ ustæ ʒj.
 Aquæ ammoniæ puræ ʒj.
 Spirit. cinnamomi ʒiv.
 Aquæ destillat. ʒvj.

M. sig. Two or three spoonfuls to be taken occasionally during the day.

Should these medicines fail in producing a beneficial effect, we may resort to the acids as recommended by Dewees.

Constipation.—This is a frequent concomitant of the pregnant condition. It may be relieved by the employment of mild laxative medicines ; castor oil, or magnesia and rhubarb may be used. Of the officinal pills, the best is the simple rhubarb or aloetic pill.

Pain in the Right Side.—After the fifth month of pregnancy, (rarely before,) the pregnant female is frequently affected with a deep-seated pain in the right hypochondriac region. This pain is not accompanied with either fever or cough, nor with any heat about the part affected. The cause of this affection may be attributed to the pressure of the fundus uteri against the concave surface of the liver. This is the opinion of Dr. Dewees, adopted for the following reasons : “ 1st, because the woman who has the fundus of the uterus thrown in advance of the symphysis pubis, is never troubled with this complaint, so far as we have yet observed ; 2d, because it never commences until after the uterus has risen out of the superior strait ; 3d, because the woman who has the fundus of the uterus thrown to the right side is more sorely afflicted, than if the right lateral obliquity did not exist ; 4th, because after the eighth month has passed, the woman feels great relief if the uterus sink into the pelvis, as it is wont to do at this period, or undergoes that change, the women term “ falling ;” 5th, because this pain is increased, whenever the diaphragm is suddenly and powerfully forced downward, as in coughing and in sneezing, though it is not felt in ordinary respiration ; 6th, because the pain increases almost in proportion to the developement of the uterus, or the advancement of the fundus ; 7th, because the woman feels less pain when standing, than while lying ; for, when standing, the

uterus sinks a little, and thus diminishes the pressure against the liver; 8th, because the woman can relieve herself, by placing herself in certain positions, as leaning to one side, or stretching herself upwards." Where the left lateral or an anterior obliquity exists, this pain in the side does not occur, because the fundus uteri does not press against the large lobe of the liver.

Generally speaking, complete relief from this pain, cannot be obtained by any remedial agents. Dr. Dewees says, that neither general nor local bleeding do any good, but in this we think he is mistaken. In conjunction with the moderate abstraction of blood, the use of small doses of blue pill or calomel will be found exceedingly serviceable.

Plethora.—When remarking upon the general effects of pregnancy upon the system, we mentioned that the blood was more richly supplied with fibrine. This is not a gratuitous assertion, for the observations of Andral and Gavarret confirms its accuracy in the most positive manner; thus, in thirty-four pregnant females, the quantity of fibrine was diminished until the sixth month of pregnancy, when the amount rose considerably above the usual physiological proportion—the blood approaching in some cases to the inflammatory condition. But the quantity, as well as the quality of the circulating fluid, is much changed by pregnancy. The quantity of blood contained in the blood-vessels is considerably greater than in the healthy physiological condition, nor can this increase in quantity be considered due, as some have supposed, to the retention of the amount of fluid lost at each menstrual epoch, for it is probable that the fœtus absorbs more than this, for its own nutrition. To what is this change in the blood in pregnant females due? Undoubtedly to an increase in the nutrition, by which more food is converted into chyle, and carried into the vessels through which the blood circulates.

But this change in the quantity and quality of the blood may be so great as to produce undue plethora, sometimes bordering on the inflammatory state, rendering some therapeutic agent necessary. The symptoms of plethora are headache, drowsiness, flushed face, vertigo, dyspnœa, full and frequent pulse, heat of skin, &c. These symptoms may be relieved by venesection. The

amount of blood drawn in these cases, should be proportional to the constitution of the patient, to the advance of the pregnancy, as well as to the intensity of the symptoms.

Sometimes the symptoms of plethora partake of a local instead of a general character, and in the female the uterus most usually suffers. In these cases, local bleeding may be prescribed in conjunction with general depletion.

Mild laxatives will be found serviceable adjuvants to the depletion.

Œdema.—This consists in an effusion of serum in the cellular tissue of any part of the body. Where the upper as well as the lower extremities are thus affected, the effusion is dependent upon plethora, but if the swelling be confined to the lower extremities, it is attributable most generally to the pressure of the gravid uterus upon the pelvic blood-vessels, occasioning an interruption in the circulation and consequent effusion. This last variety is very common, and rarely requires medical treatment. Should this become necessary, however, the use of purgatives, diuretics, and rest in the recumbent position, will afford great relief. In some cases, however, the effusion is so great that the recumbent position becomes impossible; and we are compelled to allow the patient to sit up and walk about. Bandages along the inferior extremities, with cold applications to the œdematous part, will, at times, be found useful.

Where the œdema becomes excessive, or is complicated with an effusion into any of the cavities, it becomes a complication serious in its nature, and difficult in its cure.

Varicose Veins.—Those of the inferior extremity are generally affected, and it is produced by pressure of the enlarged uterus upon the pelvic blood-vessels, causing an interruption in the circulation. As their radical cure cannot be effected until the subsidence of the cause which produces them, we must do all in our power to prevent the rupture of the enlarged veins. This may be accomplished by properly graduated pressure over the varicose veins. In addition to this, laxative medicines, and sometimes slight venesection, may be of use.

Hæmorrhoids.—These are nothing more than a varicose condi-

tion of the veins of the rectum. The treatment in this case, will consist in laxative medicines, and the application of cold and astringent washes to the part. If much pain exist about the part, narcotic ointments will be serviceable, and where the *pile* is external, a warm bread-and-milk poultice, sprinkled with laudanum, will greatly relieve the irritation. We have found great advantage in the employment of Stramonium Ointment.

As the hemorrhoids will hardly ever be cured until after delivery, we think any operation in these cases worse than useless. The amount of blood collected in the part, may be reduced by the application of leeches.

Dyspnœa.—This symptom is dependent either upon congestion of the lung, or upon its compression by the enlarged uterus. The first variety may occur at any period of pregnancy, and may be relieved by slight bleeding, light diet, &c. But when the dyspnœa is due to the pressure of the enlarged uterus, all of these remedies may be employed, but complete relief can only be obtained after the delivery of the child.

Cough.—This is sometimes dependent upon the pregnant condition, when its relief may be effected by the removal of the causes producing the cough. Where it is dependent upon disease of the lungs, of course our treatment should be directed to the eradication of that disease.

The pregnant female is sometimes affected with syncope, which may be relieved by the employment of the means usually recommended in such cases, when occurring independent of pregnancy.

The Irritability of the Nervous System is so great in some cases of pregnancy, as to prevent the female from indulging in her ordinary sleep, though there exists a great desire for repose. Where this condition of things exists, the best remedy will be moderate venesection in union with cooling and laxative medicines. After these remedies have been employed, the use of Hoffman's Anodyne, and of small doses of the solution of morphia, will be found exceedingly beneficial. The patient should also be recommended to take moderate exercise in the open air; for confinement to heated apartments adds much to the production of this state of things.

Pruritus Vulvæ.—This affection occurs in the early months of pregnancy, and the itching is so great that the female is tormented with a constant desire to relieve herself by scratching the parts. Dr. Dewees was the first to point out the true pathology of this affection, in a majority of cases at least. He considers it due to an aphthous efflorescence of the vulva in a great many cases, though he candidly confesses that this does not always exist. In some cases it is produced by want of cleanliness, by acrid discharges; in others, however, it occurs entirely independent of these causes.

The treatment in these cases, will depend upon the intensity of the symptoms, and the pathological condition of the mucous membrane of the vulva. If this be much inflamed, general and local depletion will be useful in allaying the inflammation, when the use of borax, sulphate of copper, and of nitrate of silver, may be resorted to. These may be applied to the part either in substance or solution. The internal use of the Balsam Copaiva, is said to produce a good effect. Tepid baths, sudorifics, and laxatives, may also be employed as adjuvants to the above course of treatment.

CHAPTER VIII.

SECTION I. *Utero-Gestation*.—By this term, we mean the length of time which elapses between the moment of fecundation and the period at which the full-grown fœtus is expelled from the uterus. This is a subject not only of great difficulty, but of great importance in a medico-legal point of view, since upon its determination, may depend the legitimacy of the newly born individual.

If we could ascertain with accuracy, the exact moment of fecundation, the question might be easily settled; but involved in doubt, as this point always is, the difficulty in fixing the usual term of utero-gestation is considerable, and we are forced to rely upon a few cases for its determination. In addition to this, there exists in the report of all these cases, much confusion, from the fact, that authors confound forty weeks with nine calendar months; when in fact the former consists of two hundred and eighty days, while the latter reaches only two hundred and seventy-five days, or, when February is included, two hundred and seventy-two or three days.

We do not propose discussing at large this medico-legal question, but shall confine our remarks to two points closely connected with the subject of midwifery. 1st. What is the shortest period at which gestation may terminate, consistent with the viability of the child? 2d. Can delivery be prolonged beyond the term of forty weeks?

1st. What is the shortest period at which gestation may terminate, consistent with the viability of the child? Most authors have placed this at the seventh month, but it seems that it may

* By the term viability, we mean that period of pregnancy, at which a child may be born, capable of maintaining an existence, independent of its connexion with the uterus, as prolonged as is the life of man, unless when shortened by disease, or an accident of some kind.

sometimes occur even earlier than this. To determine this point, is not a matter of indifference, for, as Montgomery remarks, this is a subject "involving on the one hand the legitimacy of the child, and on the other, the honour and fair fame of the mother, and consequently the happiness of families, when suspicions are entertained that the developement of the *fœtus* does not correspond to the period which ought to have been that of gestation, dating from the time of marriage, or the return of the husband, and so forth." Wm. Hunter says, "A child may be born alive, at any time after three months; but, we see none born with powers of living to manhood, or of being reared, before seven calendar months, or near that time. At six months it cannot be." Dr. Dewees, says he has known several instances where labour occurred before the full period. In one lady, it took place regularly at the end of the seventh month, in two others at the eighth month of pregnancy. Similar instances are mentioned by Van Swieten, La Motte, Montgomery, and others. Dr. Carpenter, in his work on Physiology, relates a case in which the Presbytery of Scotland decided in favour of the legitimacy of a child, born twenty-five weeks after marriage. In this case, the child lived more than six months. Another case is mentioned by Dr. Dodd, in which a child born at the twenty-seventh week of pregnancy, has thriven well: in this case, there was no reason to doubt the sincerity of the mother. Dr. Christison relates the case of a child, born at the farthest, at the end of the twenty-seventh week. In this instance, the evidence was taken, not only from the date of conception, assigned by the mother, but from the degree of developement which the child had undergone. Its length was thirteen inches and a half, and its weight amounted to twenty-four ounces. In the American Journal of Medical Sciences, a case is reported of a child born at the end of the sixth month of pregnancy.

From these cases we may conclude, that premature deliveries may take place consistent with the life of the child; that the seventh month is the most favourable period, but that it may occur still earlier.

The above conclusion, if it be true, not only settles a much-disputed medico-legal question, but will serve to regulate our con-

duct, as we shall see hereafter, in the induction of premature delivery.

2d. Can delivery be prolonged beyond the usual term of utero-gestation, which is forty weeks? The only data we possess for ascertaining the commencement of pregnancy, are the cessation of the catamenia, and the occurrence of quickening; but these are by no means certain, for a woman may conceive at different times of an inter-menstrual period, though it is more apt to occur either just before or just after the catamenia. The time at which females quicken, is also very various.*

The law on this subject is different in different countries; thus, in France, a child's legitimacy cannot be questioned, if it be born within three hundred days after wedlock, or the divorce or death of the husband. The French law further insists, that if it be born after that time, it is not to be considered a bastard, though its legitimacy may be contested. In Prussia, the limit of the term of utero-gestation is not extended beyond three hundred and one days. In England and in this country, the law on this subject is not fixed.

Is not the fact of the existence of these laws in France and Prussia strongly confirmatory of the possibility of the *partus serotinus*, or protracted gestation?

On this point Dr. Montgomery makes the following judicious remarks; he says, "We cannot imagine why gestation should be the only process connected with reproduction, for which a total exemption from any variation in its period should be claimed. The periods of menstruation are, in general, very regular; but who is there who does not know, that as there are on the one hand, women in whom the return of that discharge is anticipated by several days, so there are also many, in whom the return is postponed an equal length of time, without the slightest appreciable derangement of the health. Again, menstruation and the power of reproduction in the female, very generally, indeed, almost universally,

* To the term quickening, different significations have been applied. Some apply the word to the first movements of the child in utero. While others refer it to a sense of giving way or syncope which the mother experiences, when the uterus rises from the excavation above the pelvic brim.

ceases about the forty-fifth year in these countries; yet occasionally instances are met with in which both are prolonged ten or fifteen years beyond that time of life; and a similar variety is observable, in the period of the first establishment of that function in the system. If we turn our attention to brutes, the conditions of whose gestation so closely coincide with those of the human female, and are less disposed to have it disturbed, we cannot for a moment doubt the fact, that there is a great irregularity in the term of gestation in different individuals of the same species."

Our evidence in this matter may be obtained from two sources: 1st. From the analogy offered by the lower order of animals; 2d. By cases reported as occurring in the human being.

1st. What evidence is afforded by observations made on the lower order of animals? Tessier found that in the cow the ordinary period of pregnancy was the same as in the human female. Out of five hundred and seventy-seven cows, not less than twenty calved beyond the two hundred and ninety-eighth day, and some went on to the three hundred and twenty-first day. The same prolongation was observed in the mare, whose natural period of gestation is about three hundred and fifty-five days. Out of four hundred and forty-seven cases, forty-two were foaled between the three hundred and fifty-ninth and the four hundred and nineteenth day. The greatest protraction, in these cases, reaches eighty-four days, or *one-fourth of the whole period of utero-gestation*. In the sheep, the same protraction was observed, though to a less extent; thus, in nine hundred and twelve cases, the protraction occurred in ninety-six cases, but in none did it go beyond the one hundred and fifty-seventh day, or seven days over the usual period of gestation in these animals. In the rabbit, whose term of utero-gestation is about thirty days, a slight protraction was also observable.

These observations have been confirmed by similar ones made by Earl Spencer. A curious thing connected with these observations in animals, is that where the pregnancy was protracted, there existed a decided preponderance of males. As far as animals are concerned, it would then seem that the term of utero-gestation

may be protracted to a considerable extent, and analogy would justify us in expecting the same thing in the human female.

2d. What is the evidence in favour of protracted gestation, as derived from observations made on the human species.

Dr. Blundell, in his evidence in the Gardner peerage case, states, that he knew of one case which was protracted one week beyond the usual period, and on the same occasion, Dr. Merriman deposed that he had known cases to be extended to two hundred and eighty-five days, others to two hundred and ninety-six days, one to three hundred and three days, and one to three hundred and nine days.

William Hunter states that he has known some cases protracted beyond nine calendar months, while *he believed* two women to be delivered above ten calendar months from the hour of conception.

The following case is reported by Desormeaux. "A lady, the mother of three children, became deranged after a severe fever: her physician thought that pregnancy might have a beneficial effect on her mental disease, and permitted her husband to visit her, but with this restriction, that there should be an interval of *three months between each visit*, in order that if conception took place, the risk of abortion from further intercourse might be avoided. The physician and attendants made an exact note of the time when the husband's visit took place. As soon as symptoms of pregnancy began to appear, the visits were discontinued. The lady was closely watched all the time by her female attendants. She was delivered at the end of *nine calendar months and a fortnight*, and Desormeaux attended her."

The following case is related by Montgomery. He says, "An opportunity was lately afforded us of observing the natural term of gestation, under circumstances in which the day of conception was known with certainty. A lady, who had been for some time under our care, in consequence of irritable uterus, went to the seaside at Wexford, in the month of June, 1831, leaving her husband in Dublin, a temporary separation being considered necessary to the recovery of her health. They did not meet until the 10th of November, on which day he went down to see her; and being engaged in public office, he returned to town next day. The re-

sult of this visit was conception ; before the end of the month she began to experience some of the symptoms of pregnancy, and when she came to town on the 22d of February, she was large with child, and had quickened on the 29th of the month preceding. Her last menstruation had occurred on the 18th of October. She went on well through her pregnancy ; and the writer was called on to attend her in labour on the 17th of August, when she gave birth to a healthy child, after a labour of a few hours' duration. Here the gestation exceeded nine calendar months by one week, making exactly 280 days from the time of conception. It may be observed that this was the earliest instance of quickening which has presented itself to the writer, occurring as it did before the completion of the twelfth week."

The following are the facts connected with the Gardner Peerage case, as extracted from Dr. Montgomery's excellent book on Pregnancy: " In the year 1796, Captain Gardner (who afterwards became Lord Gardner) married Miss Adderley. They lived together as man and wife, until the 30th of January, 1802, on which day Mrs. Gardner took leave of her husband on board ship, and shortly afterwards he sailed to the West Indies ; from whence he returned the 11th of July following. For some time before, and also during the whole of Captain Gardner's absence, Mrs. Gardner carried on an adulterous intercourse. Upon Captain Gardner's return to England, he found his wife with child ; and she, hoping to be delivered within the proper time, made no secret of her pregnancy. When, however, she ascertained that the child could not be brought forth in time to be supposed to be Captain Gardner's, she declared that she had a dropsy, and informed his family that such was the case ; and not only Captain Gardner, but the whole of his family, considered her as labouring under that complaint. On the 8th of December, Mrs. Gardner was delivered in secret, in the presence of three persons only. The child was immediately removed to a lodging, and was afterwards christened by the paragon, who brought it up, and in all respects treated it as his son. The birth of this child was carefully and successfully *concealed* from Captain Gardner, who did not even discover his wife's adultery till the year 1803. He subsequently obtained a divorce, and

married again. He succeeded to the title in 1808, and died in 1815, leaving a son by his second marriage, who in the year 1824 presented his petition to the king, praying to be entered on the parliament-roll as a minor-peer. This was opposed by the young man, *Henry Fenton Jadis*, alias *Gardner*, who claimed to be eldest son of Lord Gardner, being born 311 days, or ten calendar months and nine days after Captain Gardner's departure from the country. The petitions were referred to the committee of privileges, who called before them seventeen of the most eminent practitioners in midwifery in London and elsewhere, and examined them, as to the possibility of such a protraction of the term of gestation, as was here contended for. *Five* of these gentlemen maintained that the limits of gestation were fixed, and consequently denied the possibility of such a protraction. The other *twelve* supported the affirmative side of the question, and some of them adduced cases very strongly in favour of their views, particularly Drs. Granville, Conquest, and Blundell. Without wishing to enter into any criticism of the medical evidence, we cannot help remarking that two or three of the gentlemen who asserted forty weeks to be the ultimatum, admitted that it might be *exceeded* by a *few* days; and we would ask if the principle of extension be admitted, how or by whom can the limits be assigned?

The House of Lords decided in favour of the petitioner, and against the counter-claimant, Henry Fenton Jadis, *but not because of the time of his birth*; for Lord Eldon, who was their chancellor, in giving his judgment, says: "It is not by any means my intention to do more than express my conviction that the petitioner has made out his claim,—that there are a great many more questions, that arise in a case of this nature, almost the whole of which were considered in the Banbury peerage; but without entering into a detail of these questions, and *without entering into a discussion as to the ultimum tempus pariendi*, I am perfectly satisfied, upon the whole evidence, that the case has been made out.

"It was the *adultery* of the mother, and the *concealment of the birth of the child from the husband*, which justified the house in refusing the petition of the counter-claimant. If the only point in

the case had been that he was not the son of Lord Gardner, because it was *impossible* his mother could have gone forty-four weeks with him, the House of Lords could not have declared him illegitimate; and when Lord Eldon said he would give his opinion '*without entering into the question of the ultimum tempus,*' it is perfectly clear he did so for the purpose of guarding against the decision being ever taken as a precedent, that a gestation protracted four weeks beyond the usual time, should be a ground for bastardizing a child."

In Montgomery's work on pregnancy, a variety of cases may be found confirmatory of the fact, that utero-gestation may be protracted beyond its usual period, and we would recommend the student to consult that work.

Rigby says, that in ten cases observed by him, "where the date of conception was based on other data than the last appearance of the catamenia, one-third went beyond two hundred and eighty days." One of his cases, however, was protracted ten or eleven days beyond the full period.

Hamilton says, that the result of his experience is as follows: "In one case, many years ago, the lady exceeded the tenth revolution (of the menstrual period) by twelve days; another lady exceeded it by sixteen days, and another by twenty-four days. This latter case menstruated on the 1st of August, and was not delivered till the 28th of June. Another lady, mother of a large family, exceeded her period by above a fortnight on the 4th of March, when her husband went to England, where he had resided for some months; but she was not delivered till the 6th of December."

Burns says, "the longest term I have met with, is ten calendar months and ten days, dated from the last menstruation. In the case of one lady who went this length, her regular menstrual period was five weeks; and in her other pregnancies, she was confined exactly two days before the expiration of ten calendar months after menstruation."

In the case of Anderton versus Whitaker, tried at Lancaster, a few years since, it was sworn to, that the parties had had connexion on the 8th of January, and never at any other time; and in this

instance labour did not occur till the 18th of October, making 284 days as the period of gestation.

Dr. Dewees has recorded the following case, which incontestably proves that the term of utero-gestation may be extended to a certain number of days. "The husband of a lady who was obliged to absent himself for many months in consequence of the embarrassment of his affairs, returned, however, one night, clandestinely; and his visit was only known to his wife, her mother, and Dr. D. The consequence of this visit was the impregnation of his wife; and she was delivered of a healthy child in nine months and thirteen days after this nocturnal visit." In this case, admitting that the estimate was made in calendar months, it proves that pregnancy was protracted beyond its usual time, at least six, and possibly eight days.

Dewees adds, "that in at least four females that I have attended, each of these women went one month longer than the calculations made, from an allowance of ten or twelve days after the cessation of the last menstrual period, and from the quickening, which was fixed at four months." Another case is alluded to by Dewees, in which a lady, of this city, was delivered ten months after the departure of her husband for Europe.

The following communication from Professor Atlee, containing the account of two cases of protracted gestation, as well as the able opinion of Judge Lewis, an eminent Jurist of this commonwealth, upon the trial of E. F. Hoover, for fornication and bastardy, have an important bearing upon this question.

Philadelphia, July 29, 1846.

TO ISAAC HAYS, M. D.

Dear Sir:—The Hon. Ellis Lewis, of Lancaster, Pa., has kindly forwarded to me, for your Journal, two of his charges, bearing on medico-legal questions. One refers to the case of the "*Commonwealth v. Elisha F. Hoover*," indicted for fornication and bastardy; the other to a suit brought by me against the county of Lancaster to test the principle of compensation for post-mortem examinations at inquests.

In reference to the case of fornication and bastardy, I will give

you memoranda of two cases, occurring in my practice several years ago, viz :—

CASE I.—The wife of Valentine Shaeffer, Rapho Township, Lancaster County, lost her catamenia, March 22d, 1832, quickened August 5th, 1832, and was delivered March 22d, 1833, with forceps, of a female child. First presentation, fourth child.

CASE II.—The wife of Samuel Henry, same township, lost her catamenia August 6th, 1832, quickened December 25th, 1832, was delivered August 13th, 1833, of a female child. First presentation, third child.

Both the above children were living, healthy, and unusually large, and the mothers enjoyed excellent health.

In these cases there was no possible motive for deception, nor is it probable that the women were deceived. They experienced the same symptoms as in previous pregnancies, and made their calculations as before, engaging my services for a period long before the time they were actually required. From the moment of quickening, they continued to feel the motions of the children daily, until the time of parturition.

I have not the least doubt of the truthfulness of the evidence in the above cases. The circumstances were so extraordinary to me at the time that I closely investigated them, so as to satisfy myself on this point.

If these are not cases of protracted gestation, how are they to be explained ?

Very respectfully, yours, &c.,

WASHINGTON L. ATLEE.

LANCASTER QUARTER SESSIONS.—*Hon. Ellis Lewis, Pres't.*

1. *Com. vs. Elisha F. Hoover.*—Indicted for fornication and bastardy with Catherine E. Rife. This trial lasted two days, and excited considerable interest, from the vigour with which it was conducted, and the novelty of the defence. The complainant swore that the child was begotten on the 23d of March, 1845, and born on the 30th of January, 1846, making the period of gestation 313 days—being 33 days over the usual time. The

defence relied mainly on the *time*, and called several physicians to prove the *impossibility* of gestation being protracted so much beyond the usual period. Doctors Kerfoot, Burrowes, Alex. Cassidy, J. S. Carpenter, Smith, and Leonard, testified with more or less positiveness against the possibility of protraction. Dr. Kerfoot considered that nature had established nine calendar months as the period of healthy gestation, and that that period could not under any circumstances be materially extended. Dr. Burrowes had formed his opinion from the absence of facts: he had never known gestation to exceed nine calendar months, and did not believe it possible. The other medical gentlemen called on the part of the defence, concurred in substance with these, though they all admitted that *the books* generally held differently.

The prosecution called Doctors John L. Atlee, F. A. Muhlenberg, P. Cassidy, H. Carpenter, Fox, and Baker.

Dr. J. L. ATLEE was of opinion that the ordinary period of utero-gestation was nine calendar months, or from 270 to 280 days—that, although improbable, there was a *possibility* of its being protracted to 313 days. He had formed his opinion from two cases which had occurred in his own practice, in which, by all the usual methods of calculation, the patients must have gone at least ten calendar months; from the testimony and opinions of standard authors, such as Wm. Hunter, Burns, Merriman, Blundell, Velpeau, Moreau, Dewees, &c. &c.; and from analogous cases among domestic animals, as proved by experiments made with great care, particularly by M. Tessier, in France.

The other gentlemen called for the prosecution, concurred in the opinions of Dr. Atlee, for various reasons stated, which we have not space to report.

Charge of the Court.—COM. vs. ELISHA F. HOOVER. The defendant is indicted for fornication and bastardy. The prosecutrix, CATHERINE E. RIFE, is a competent witness, but her credibility is for the jury. According to her account, the child was begotten on the 23d of March, 1845. It was born on the 30th January, 1846—a male, fine, large, and healthy. The period of gestation was 313 days. It is conceded that the defendant had no intercourse with the mother after the 23d of March, 1845, and the

time of delivery is fixed with equal certainty. A question of science has arisen respecting the possibility of protracted gestation.

The usual period is nine calendar months, or from 273 to 275 days. What has been denominated the *extreme* of the *usual period* is 280 days, or ten lunar months. But whether any, and if any, what longer time may be allowed as possible, are the questions which this case presents for decision. Medical writers of celebrity and authority are arrayed on both sides of these questions. And the medical witnesses upon the stand are, in like manner, divided in opinion. In construing this evidence, so far as respects the **FACTS** narrated by each, it is proper to consider that writers and witnesses are respectively relating only the results of their own knowledge: and, when one states that no case of protracted gestation has fallen under his observation, it is but negative testimony, and cannot justly be relied upon to invalidate the affirmative evidence of others equally entitled to credit, who enumerate cases of the kind, which they positively affirm to have come within the range of their practice and knowledge. In the most familiar transactions of life, witnesses will differ in their narration of the circumstances. In an account of a simple assault and battery, the bystanders frequently vary in their statement of the facts. Some narrate incidents which others omit. Conceding all the witnesses to be equally worthy of credit, the rule is to reconcile their evidence so that all will stand consistently together, if this be reasonably practicable. Some witnesses observe circumstances which others have not seen. Negative evidence is therefore deemed insufficient to outweigh affirmative statements from witnesses equally entitled to credit. One gentleman, in a long course of practice, may have failed to observe any case of the kind. Another, in a very brief period, may have noticed several. And it is reasonable to believe that where such a diversity of **OPINION** exists, each will be in some measure influenced by his own professional experience; and that this will also, to some extent, affect his belief in the cases reported by others. There are doubtless many of these cases where the struggle for character and property, and the circumstances of the parties

whose interests have been involved, have furnished temptations to falsify, and may have influenced the decisions of the tribunals. But, after making all proper allowances for cases of this description, the whole evidence on the question, when fairly considered, appears to show that cases of protracted gestation are not impossible, although their existence is very unusual.

The heads of wheat in the same field do not all ripen together. The ears of corn on the same stalk do not all come to maturity at the same time. Even the grains of corn on the same ear ripen at different periods. The fruit on the same tree shows the like deviation. A portion will ripen and fall while other portions remain comparatively green upon the parent stalk. The eggs of the fowl, under process of incubation at the same time, are subject to the same variation. In quadrupeds, if the testimony of M. Tessier be believed, we have proof of the like irregularity. Whatever may be the causes, operating in each case, to divert nature from her accustomed course, to accelerate or delay her usual progress, the human species, like the rest of creation, seems occasionally under their influences. The developments of puberty, although generally shown at a certain age, are far from regular. Some individuals approach it earlier—others later in life. Intellectual maturity is subject to the same irregularities. Some are precocious, others astonishingly tardy in arriving at the usual degree of discretion. The intervals between the catamenial visits, although in general regular and fixed, exhibit remarkable deviations. The final departure of the catamenia, although generally to be expected at a certain age, is as irregular as their first approach, and as subject to variation as were their periodical returns. A certain period of life has been usually assigned for the termination of a mother's perils, but the instances of extensive deviations from this general rule are numerous and well-established. The gestation of one child at a time is according to the usual course of nature, but the births of twins, triplets, &c., furnish indubitable proofs of astonishing departures from the usual course. The sensations of the mother produced by the elevation of the fœtus from the cavity of the pelvis, (called quickening,) although usually occurring at a certain period, are known to be subject to the like departure from the

usual time.—It has been said that human life does not generally extend beyond 70 years. But if this be the general rule, the departures are numerous. The most distinguished jurist perhaps, now living in the whole world, (Chancellor Kent,) will be 83 years old on the 31st of July next; and yet, within a few days I have been honoured by the receipt of a letter from him, under date of the 18th inst., in which he states that he is still in “good and active health—that his relish and ardour for studies and legal learning continue unabated—that he has the blessing of good eyes, and that he is still an observer of what passes with lively sensibility.” This instance may serve to illustrate not only the occasional deviation from general rules respecting the duration of human life, but the like variation in respect to intellectual vigour, by which one individual attains a pre-eminence over the generality of mankind. All Nature abounds with occasional departures from her general customs. Even the compass, which guides the mariner on the trackless ocean—which enables science to fix with reasonable certainty the boundaries of kingdoms and farms, and the truthfulness of which to its accustomed law has been perpetuated by a proverb—is subject to mysterious but acknowledged variations.

From analogy, and from the statements of distinguished authors and eminent witnesses, after making every allowance for mistakes, and the operation of unfavourable influences, we are led to the belief that, although Nature delights in adhering to her general usages, she is occasionally retarded in her progress, and otherwise coerced, by causes not always apparent, into extensive deviations from her accustomed path.—And we are induced to believe that protracted gestation, for the period of 313 days, although *unusual* and *improbable*, is not *impossible*. The evidence to establish the existence of such a considerable departure from the usual period, should be clear and free from doubt. The witness should possess a character beyond reproach, and her testimony should be consistent and uncontradicted in all material facts. If the jury are satisfied that the evidence for the commonwealth is of this character, the unusually long period of gestation does not require them to disregard it. The law fixes no period as the *ultimum tempus pariendi*. The usual period has been stated, but longer time may

be allowed, according to the opinions of physicians and the circumstances of the case. The question is, therefore, open for the decision of the jury. If they believe the witness, they may find the defendant guilty.

[Here the court drew the attention of the jury to the prominent facts, tending on the one side to impeach, and on the other to support, the credit of the prosecutrix; and then left the case to the jury, with the direction that, if they entertained reasonable doubts of the defendant's guilt, he was entitled to an acquittal.]

April 24th, 1846.

ELLIS LEWIS.

NOTE.—A lady of respectability was examined on oath, in the course of the trial, and stated that she had been the mother of nine children—that to the best of her judgment and belief, the period of gestation, in the case of the seventh child, was over ten months. That in addition to the usual data she relied upon the time of quickening, which happened, as she believed, at the usual time, and that the birth of the child did not take place until seven months after that event.

The jury found the defendant **GUILTY**, and the usual sentence was passed upon him.

Frazer and Mathiot for the Commonwealth—Stevens for the defendant.

Such evidence as that cited above, can hardly leave a doubt in the mind of any one as to the possibility of protracted gestation; but to extend this period to extremes, would be as injudicious and unfair as to deny its existence at all. In questions of this kind, collateral evidence should, in doubtful cases, considerably influence our decision: thus, if the parties concerned be of good moral standing, there would be greater facility in admitting these cases of extremely protracted pregnancies, than where the character of the female was at least not above suspicion. If called upon to give a positive opinion, we would say that the term of utero-gestation frequently overruns the period of nine months by several days; that in some cases it was extended to ten months, while in a few rare instances, it would appear that the female had carried her child eleven months. On the other hand, the term of utero-ges-

tation may be terminated at the end of twenty-six weeks without affecting the legitimacy of the child or the character of the mother.

To what cause may be attributed this retardation or acceleration of the termination of utero-gestation? This is one of those inexplicable operations of nature, which so often occur, to those who devote themselves to the study of scientific subjects. The views of Rigby, seem to present an ingenious explanation of the cause of labour. He says, "the reason why labour usually terminates pregnancy at the fortieth week, is from the recurrence of a menstrual period at a time during pregnancy when the uterus, from its distension and weight of contents, is no longer able to bear that increase of irritability which accompanies these periods, without being excited to throw off the ovum." This view is supported by the facts, that in cases where there is a tendency to premature delivery, the most critical moment is always observed at that time which would have been the period of menstruation, had not pregnancy existed.

Again, in cases of hemorrhage before labour, of placenta prævia, &c., the discharge is usually observed to come on at that time which would have constituted the catamenial epoch, in the unimpregnated condition of the organ. That the irritability of the uterus is greatly increased during the menstrual period cannot be doubted, and it is certain that this periodical irritability exists even during pregnancy, during which the enlarged uterus may have its tendency to expel its contents, greatly increased. Thus, if at the end of forty weeks from conception, the catamenial excitement exists, then the irritability of the organ being greater, labour would most probably come on and terminate in the delivery of the child at the exact time. If, however, where no disposition to abortion existed, the periodical stage of excitation arrived at the end of the thirty-eighth or thirty-ninth week, it is probable that the uterus not being fully distended, would carry its contents until the next period for the catamenia—in which case labour would have occurred forty-one or forty-two weeks after conception.

In the above supposed case, if there existed any tendency to abortion, labour might commence at the thirty-eighth or thirty-ninth week, in which case the term of utero-gestation would fall short of

its usual time. Whether this be the true explanation or not it is difficult to say ; but the theory seems to us more plausible than any other which has yet been offered.

SECTION II. *Extra-uterine Pregnancy*.—When the *ovum* is fecundated, it usually passes into the uterus, where it undergoes its full developement ; to this, however, there are some exceptions, and in these cases, fortunately of rare occurrence, the impregnated ovum never reaches the cavity of the uterus, but undergoes imperfect developement by attaching itself either to the ovaries, or the Fallopian tubes, or the sides of the abdomen. These cases constitute what has been termed extra-uterine pregnancy, which may be divided into, 1st. Ovarian pregnancy, 2d. Tubal pregnancy, 3d. Ventral pregnancy, 4th. Utero-tubal pregnancy, 5th. Interstitial pregnancy. Riolan, professor of anatomy at Paris in the time of Louis XIII., refers to two cases of tubal pregnancy, which had been observed previous to his time ; besides this, he states that in his own practice he met with a similar case. Since that time numerous cases have been recorded by various physicians.

According to some authors, in extra-uterine cases, the usual symptoms of uterine pregnancy are always present. Dr. Heim, of Berlin, asserts, however, that there is no morning sickness ; and Dr. Robert Lee, of London, denies that the internal surface of the uterine cavity is covered with the *membrana decidua*.* The enlargement of the abdomen in these anomalous cases is more irregular in its shape, and less uniform in its developement in extra-uterine than in uterine pregnancies.

The existence of extra-uterine pregnancy may be suspected *where* the abdominal tumour is discovered at an early period above the symphysis pubis ; *where* it lies in the iliac fossa, and is easily felt through the abdominal walls ; *where* the uterus is found, upon an examination per vaginam, neither increased in size nor altered in firmness. With these general distinctive signs, we will pass to the consideration of each variety.

* We understand that there is in Dr. Meigs' collection at the Jefferson Medical College, a case of extra-uterine pregnancy, in which the uterus was found lined with the deciduous membrane.

In *Ovarian Pregnancy*, the fœtus is retained in a sac, with its placenta attached to the ovary. Its duration may be extended to five or six months, when by the gradual increase in the size of the fœtus, which may be either dead or alive, the sac bursts. During the continuance of this variety of pregnancy, the patient suffers, from time to time, most excruciating pain about the pelvis; constipation is present, with difficulty of micturition. The uterus is not found altered either in size, form, or consistence, when examined per vaginam, though its cavity is said by Hunter to be lined with the deciduous membrane. During the interval of the paroxysms of suffering, the patient's condition is usually comfortable. Towards the close of the fourth, fifth, or sixth month, during the continuance of a paroxysm of pain, the sac enclosing the fœtus, bursts with a sensation of something giving way. The pain is increased, followed by syncope and death.

Upon examination after death, the fœtus, with an immense amount of blood, &c., is found discharged into the cavity of the abdomen. The patient, in this case, perishes from the effects of peritoneal inflammation.

In *Tubar Pregnancy*, the fœtus is contained in a sac formed by the walls of the fallopian tubes, with its placenta attached to their inner face. This variety of pregnancy is known by the early appearance of a tumour over the symphysis pubis; by great pain, from time to time; by the unaltered condition of the uterus; by the mobility of this organ, independent of that of the tumour. This last symptom is not so apparent in tubar as in the ovarian or ventral form of extra-uterine pregnancy. During the increase in the size of the fœtus, the patient suffers intense pain in the pelvis, till finally, at the end of the second or third month, the sac (formed by the fallopian tubes) bursts, followed by increase of pain, great prostration, and death. The fœtus, &c., upon examination, are found discharged into the abdominal cavity. Many cases of this kind may be found recorded in the work of M. Colombat, on diseases of females.

Ventral Pregnancy.—In this case, the fecundated ovum falls into the abdomen, upon the walls of which it soon forms an attachment, by which it is nourished. The fœtus, in this case, may

remain in the abdomen not only till full term, but even longer. In a case reported by Dr. Neibel of Heidelberg, the fœtus remained in the abdomen fifty-four years. Another is recorded by Dr. Heickel, in which the ventral pregnancy lasted forty years. Other similar cases are mentioned in the works of Rigby, Lee, Colombat, &c.

During this species of pregnancy, the female suffers great pain in the abdomen; the tumour is found very early, in the iliac fossa; the uterus is unaltered in shape, size, and consistence, and its mobility is greater than in another form of extra-uterine pregnancy. The movements of the fœtus are sometimes apparent till the full term; the sac within which it is contained, gradually forms adhesions with the surrounding parts. Inflammation is apt to ensue, with the formation of abscess, when the fœtus may be discharged either through the abdominal walls, or through the *rectum*, *bladder*, &c.

Some cases of ventral pregnancy have been recorded, which produced no evil effect on the mother, and where she became pregnant in the natural way, while the original fœtus remained in the cavity of the abdomen.

Interstitial Pregnancy.—In this case, the fœtus becomes entangled within the fibres of the uterus. How this is accomplished is not yet understood. The same symptoms are present, as have been already noticed, as belonging to the other varieties of extra-uterine pregnancy. The sac in which the fœtus is contained, ruptures about the same time of gestation as it does in ovarian pregnancy. An account of several cases reported by Breschet, may be found in M. Colombat's work on females.

Utero-tubal Pregnancy.—This variety presents nothing, as far as the symptoms are concerned, different from those already described.

No satisfactory explanation of the cause of these anomalies has as yet been offered.

Treatment.—The pain and inflammation must be treated on general principles. If an abscess form, it must be opened as soon as practical, at the same time that the patient is supported by tonics, nutritious diet, &c.

Constipation is always present, and should be relieved by appropriate remedies.

In ventral pregnancy, where the child lives to the full period of utero-gestation, it becomes a question as to the propriety of resorting to gastrotomy, as a means of delivery. It has been performed, with safety to the child, but in every case the mother's life has been lost. That the life of the mother is more important than that of the child, cannot be doubted; but does the mother run greater hazard from the operation, performed at a proper time of extra-uterine gestation, than she does with the existence of a putrid mass contained within the abdomen, which will probably eventually destroy her? Or, if there be no inflammation present, and the child be alive, is the risk as great as in the Cæsarean section? These are questions of difficult solution, and facts are still wanting to justify an expression of a positive opinion upon the subject.

CHAPTER IX.

Parturition. By the term parturition, or labour, we mean that process by which, at a certain period of the term of utero-gestation, the fœtus and the secundines are expelled from the uterus, through the vagina, &c., into the external world.

Many terms have been employed to designate the different periods of pregnancy at which the expulsion of the uterine contents takes place; thus, a female is said to be *in labour at full term*, when the delivery takes place a few days before or after the period of nine months; but if the uterine contents are expelled during the seventh or eighth, or the early part of the ninth month, the labour is termed *premature*. Again, the fœtus may be discharged before the one hundred and eightieth day, and this constitutes *abortion*, a period at which the viability of the child is scarcely possible.

Before entering upon labour, as it occurs at full term, we must say a few words in regard to the phenomena of premature delivery. The causes of this accident are numerous, viz. the disease or death of the fœtus; over-distension of the uterus, either from multiple pregnancy, or from an undue amount of liquor amnii; the early discharge of the waters; fatiguing exercise; too great indulgence in the use of purgatives; the occurrence of inflammatory or eruptive diseases; excessive depletion; plethora; undue irritability of the uterus, &c.

The approach of premature labour is usually announced by a chill; by the occurrence of uterine contractions, &c. Its progress is not so regular as in labours occurring at full term, since at this period of pregnancy the cervix uteri has not, in the majority of cases, undergone that effacement, which is so favourable to an easy and rapid dilatation of the os uteri. Hence it is, that the period of dilatation is much prolonged, while that of expulsion, owing to the small bulk of the fœtus, is much more rapid, though it would seem to be followed more frequently by hemorrhages, &c.

From the observations of Prof. Dubois, it appears that in premature deliveries cranial presentations are not so frequent, while those of the pelvis increase with the remoteness of the full term of utero-gestation. When symptoms of premature labour occur, every effort should be made to prevent the accident, since the life and perfect formation of the fœtus is somewhat endangered, while the inconveniences to the mother are not without their importance. If the fœtus be dead, the course to be pursued will be somewhat modified.

But how are we to treat a case of threatened premature delivery? Absolute rest in the horizontal position is essential in the management of these cases. If the patient be plethoric, venesection will be required in conjunction with opiate injections, and a strict adherence to a mild, nutritious, but unstimulating diet.

When, in spite of all treatment, labour comes on, it must be treated as if the full term of utero-gestation had been reached.

In explaining the process of parturition, three points will deserve consideration: 1st. What are the causes of labour? 2d. What are the physiological phenomena concerned in delivery? 3d. What is the mechanism of the different varieties of labour?

The causes of labour may be divided into the *predisposing* and the *efficient*. It is exceedingly difficult to explain the cause of the occurrence of labour, at a certain period of the term of utero-gestation. Some have attributed it to the effect produced by the full-grown fœtus upon the uterus, while others suppose that at the end of nine months, the retaining power of the cervix uteri is overcome by the continued action of the longitudinal fibres of the uterus, and that the expulsion of the fœtus is then very easily effected by uterine contractions. Prof. Dubois, who has adopted the ingenious theory of Jones Power, makes the following remark: "So long as the neck of the womb preserves a certain length, the most inferior fibres, (those which receiving more specially the nerves of animal life, enjoy the highest degree of sensibility,) are not exposed to any kind of excitation; but when at the end of pregnancy, and in consequence of the gradual effacement of the superior portion of the neck, its whole length has been employed in assisting the development of the organ, there only remains a circular *rim*, com-

posed of the horizontal and circular fibres belonging to the external orifice. The developement of the uterus can only continue by exerting a violent traction upon the fibres of the *os uteri*—but more than this, these fibres being brought in contact with the bag of waters, and consequently, with that portion of the *fœtus* which presents, become irritated and worn down by the continual pressure to which they are not habituated. This double source of irritation, continually existing, necessarily induces a contraction of the fibres of the body of the uterus, in the same way that irritation of the sphincter vesicæ and of the sphincter ani, produces contraction of the walls of the bladder and rectum.” This theory is exceedingly ingenious; but we have shown, in another chapter, that the effacement of the *cervix uteri* does not commence at its upper portion, since the *os internum* of the neck of the womb, in a majority of cases, remains closed, until the last month of pregnancy. We extract from the work of Rigby, a much more satisfactory explanation of the point. He says, “the reason why labour usually terminates pregnancy at the fortieth week, is from the recurrence of a menstrual period at a time during pregnancy, when the uterus from its distension and weight of contents is no longer able to bear that increase of irritability which accompanies these periods, without being excited to throw off the ovum.” This view is supported by the fact, that in cases where there is a tendency to premature delivery or abortion, the most critical moment is always observed at that time, which would have been the period of menstruation, had not pregnancy existed. Again, in cases of hemorrhage, before labour, the discharge is usually observed to come on at that time, which would have constituted the menstrual epoch in the unimpregnated condition. That the irritability of the uterus is very great during the catamenial flow is beyond doubt, and it is equally certain, that this periodic excitation continues to recur even during pregnancy.

Now, according to this view of Dr. Rigby, if at the end of forty weeks from conception, the catamenial excitement comes on, then the irritability of the organ being increased, labour would most probably occur, and terminate in the delivery of the child at the exact term. If, however, (there being no disposition to abortion,)

the periodical stage of excitement arrived at the end of the thirty-eighth or thirty-ninth week, it is probable that the uterus, not being fully distended, would carry its contents until the next catamenial epoch, in which case the term of utero-gestation would be prolonged to the forty-first or forty-second week. In the case just supposed, labour might, however, occur as early as the thirty-eighth or thirty-ninth week, especially if there existed any tendency to abortion.

It must be confessed that these theories are not entirely satisfactory, and that after all that has been written on the subject, it is more philosophical to say with Avicenna, "that at a certain time, labour comes on, by the grace of God."

The causes effective in producing the expulsion of the child are much more easily ascertained. By the old writers on obstetrics, it was supposed that the *foetus* was the *active* agent in delivery, but the objections to this notion are so numerous, that it has been abandoned by the writers of the present day. It is now admitted by every one that the expulsion of the *foetus* is due to the involuntary contractions of the uterus, aided by those of the abdominal muscles; but more than this, the contractions of the uterus alone are sufficient to cause the expulsion of the child, as is clearly proved by the facts that delivery has been accomplished even in cases of paralysis of the muscles of volition, and also in cases of *procentia uteri*. On the other hand, when the uterus has failed to contract from inertia or other causes, the action of the abdominal muscles have been found sufficiently powerful to expel the child. To render the action of these muscles as effective as possible, the lungs are, by a deep inspiration, filled with air, which is prevented from escaping by contraction of the glottis. In this way the ribs are rendered fixed, and the diaphragm remains in a state of perfect contraction, so that as soon as the abdominal muscles contract, the intestines are thrown up against the diaphragm, and the whole force of these contractions is spent upon the enlarged uterus, and its contents, as soon as the *os uteri* is dilated, are necessarily driven out through the vagina, &c. It will now be observed that the diaphragm and the other muscles of inspiration only act indirectly, by fixing the ribs so as to furnish immovable points, upon

which the abdominal muscles may act without any loss of power. The power of these muscles is so great that it may be easily seen how a rupture of the soft parts may take place, when their dilatation is imperfect; hence the necessity of requiring the patient to desist from any voluntary efforts "*to bear down,*" until the os uteri, &c., are fully dilated.

Physiological Phenomena of Labour.—Under this head we will treat of those vital changes which take place during the progress of labour, and ultimately effect the dilatation of the soft parts, and the expulsion of the child from the uterus. These phenomena may be grouped under three heads, each of which constitutes a distinct stage of labour: *the first*, extending from the commencement of labour to the dilatation of the os uteri; *the second*, including the expulsion of the fœtus; and *the third*, the detachment and delivery of the placenta.

Before describing the progress of labour, it will be necessary to examine into the nature of those contractions, commonly called labour pains, and into the mode in which these contractions effect the dilatation of the os uteri, and the subsequent expulsion of the uterine contents. The contraction of the fibres of the uterus are always more or less painful, hence it is, that, the word "pain" has become synonymous with uterine contraction. The sensation of pain is due to the pressure which the uterine nerves receive during each contraction of the uterus, and also to the constant traction which the longitudinal fibres exert upon the circular fibres of the cervix uteri. Another peculiarity of uterine pains is, that they are intermittent, coming on at different intervals of time, continuing a few moments, when they pass off, leaving the patient in comparative ease. The uterine pains begin some time before labour, and in this case, they are very slight, but little painful, and exclusively confined to the uterine globe. As labour comes on, they become more severe, and during their continuance, the uterus is found hard and contracted, and the os uteri, when examined per vaginam, feels rigid, and as it gradually dilates, it allows the protrusion of the bag of waters into the vagina. These pains, which occur during the first stage of labour, are intended to dilate the os uteri so as to allow the passage of the child; hence they have been

called "preparatory," and are entirely confined to the uterus. But, how is the dilatation of the os uteri effected? It is not dilated by the mechanical pressure of the presenting part of the bag of waters, upon its circumference; but by the constant antagonism which is going on between the longitudinal and circular fibres of the uterus, the action of the latter is overcome, and the dilatation of the os uteri takes place.

The rapidity with which the os uteri dilates, depends very much upon the force and frequency of these preparatory pains. Generally, it is less rapid during the first than during the last half of the first stage of labour. In primiparæ, the dilatation is effected more slowly than in those who have previously borne children; but the rapidity with which this stage of labour is accomplished, will depend upon many other circumstances,—thus, obliquities of the uterus, unfavourable presentations, &c. &c., will tend to retard the process. If the os uteri be thick and soft, it will dilate more easily than where it is thin and resisting. In the primiparæ, the orifice of the uterus, which at the commencement of labour is usually thin, soon becomes thick and remains so until a very short time previous to its complete dilatation.

When called to a case of labour, it may become necessary to determine whether this process has commenced or not: this may be known, by the existence of pains; by the hardening of the uterine globe during the existence of the pains; by the gradual dilatation of the os uteri; by the protrusion of the bag of waters during the uterine contraction. An open os uteri must not be regarded as a sure sign of the existence of labour,—for in the case of the multiparæ, it is frequently found large enough to admit the end of one or two fingers, a fortnight or more previous to delivery. But where, in making an examination per vaginam, the os uteri dilates during the presence and contracts during the absence of a pain, we may be sure that labour has commenced.

There are several signs premonitory of the approach of labour, which may, unless labour come on very rapidly, be observed in the following order: 1st. Sinking of the uterine globe in the abdomen. This may occur as early as the middle of the ninth month, but usually it is observed only a few days previous to the

commencement of labour. The sinking of the fundus uteri is due to the complete effacement of the cervix uteri, which occurs about this time, and in some cases, the relief it affords the female is very marked. The respiration is less oppressed. The stomach being less compressed, its functions become more natural, and the female is less exposed to nausea and vomiting. The relief from these unpleasant symptoms, produces a sensible effect upon the moral condition of the patient. She becomes more cheerful and less apprehensive. 2d. Previous to the approach of labour, the female is troubled with a frequent desire to evacuate the bladder and rectum,—a symptom which is caused by the pressure of the presenting part upon these organs. 3d. A discharge of mucus from the vagina, sometimes reddened with blood, is usually observed about the commencement of labour. This undue discharge of mucus arises from an exalted secretion of the follicles of the vagina, and the blood, with which it is mixed, proceeds from the rupture of the blood-vessels which pass from the cervix uteri to the membranes of the foetus. This muco-serolent discharge from the genitalia has been called by midwives, "*the show*."

These premonitory symptoms are often accompanied by slight pains, which sometimes occur several days previous to the commencement of labour.

First Stage of Labour.—When the full term of utero-gestation has been reached, the pains to which we have alluded, increase in frequency and force. They are of a sawing character; commencing in the back, they pass round the front of the abdomen, as far down as the groin. During the existence of these preparatory pains, which are confined entirely to the uterus, the body of the uterus and the os uteri are rendered rigid and hard, and if the mouth of the organ be much dilated, the protrusion of the bag of waters into the vagina is easily felt, while the presenting part, if it be low down, will be found to ascend during each contraction, resuming its original position, however, as soon as the pain disappears. When the uterine contraction has subsided, the fibres of the uterus become relaxed, and the effect of the pain upon the os uteri may be estimated by an examination per vaginam.

These pains are frequently accompanied by rigors, nausea,

and vomiting, all of which are usually favourable to the dilatation of the os uteri. The preparatory pains are borne by the female with very little patience, and the slowness with which the labour seems to progress, renders her very apprehensive as to the result. During the continuance of the uterine contraction, the pulse rises, the heat of skin is increased, and the patient gives vent to a species of moaning, not to be mistaken, and entirely different from the cries uttered, when the child is passing through the vagina, &c. As soon as the pain has ceased, the female is for a time more comfortable, but in the first stage of labour, the intermission of the pains is not so perfect as when the delivery is farther advanced.

It is under the influence of these uterine contractions that the os uteri is gradually but completely opened, so that the cavity of the uterus and that of the vagina form one uninterrupted canal sufficiently dilated to allow the passage of the child.

But the vagina, the perineum, &c., have also, during the first stage of labour, undergone certain vital changes, by which the tissues composing them have become soft and cushiony, and well lubricated with a copious secretion of mucus. This increased flow of mucus not only serves the important purpose of lubricating the parts, but it acts as a topical depletion, by unloading the congested blood-vessels, and rendering the parts more capable of distension. "If the entrance of the vagina is small, the neighbouring parts cool, dry, inelastic, and as if tightly drawn over the bones; if the finger, in spite of being well oiled, and carefully introduced, produces pain upon the gentlest attempt to examine, we may expect a tedious and difficult labour."

The duration of the first stage of labour is exceedingly variable, but, as a general rule, it may be stated that where nothing unfavourable exists, the complete dilatation of the os uteri will be accomplished in from six to eight hours; *but* it may require a much longer time, without the occurrence of any evil results. Churchill says, that where the first stage was thus protracted, "no evil consequences resulted, and they (the labours) were amongst those in whom the remaining stages of labour were the shortest."

With the full dilatation of the os uteri, the first stage of labour

is terminated ; its object has been, not the expulsion of the child, but the preparation of the passages for that purpose.

Second Stage of Labour.—The os uteri now being dilated, the bag of waters usually ruptures, and the presenting part of the fœtus is brought in direct contact with the os uteri, when a new order of things arises; hitherto the uterus alone has contracted, but now the action of the abdominal muscles becomes roused, giving rise to a variety of pains which have been termed expulsive. This change in the character of the pains is due to a sympathetic connexion “between the os uteri and vagina on the one hand, and the abdominal and other muscles on the other. We see this connexion most distinctly in those difficult labours, where the head is pushed down deeply in the pelvis, even to the very outlet, and where the os uteri, which is but little dilated, is protruded before it. In such cases, we never see the really powerful and continued action of the abdominal muscles excited, let the head press never so forcibly upon the rectum; but as soon as the os uteri (perhaps after much suffering) has retracted over the head, the whole auxiliary action of the abdominal muscles commences.” In this wise provision of nature, we are taught a valuable lesson, viz., to require the patient to resist every effort “*to bear down*,” until the os uteri is well dilated. It must be remembered that the action of the abdominal muscles is under the influence of the will; and knowing this, bystanders do not hesitate to advise the patient “to bear down,” in order to hurry the labour. Such advice is bad, since these voluntary efforts, when persisted in, serve to fatigue the patient, and if sufficiently powerful, might, by forcing the fœtus through an undilated os uteri, produce a terrible laceration of all the soft parts concerned in delivery. So soon, then, as the os uteri is well dilated, the contraction of the abdominal muscles becomes associated with that of the uterus, for the purpose of expelling the fœtus, &c. During these pains, the heat of skin is increased, the patient becomes agitated, and the pulse is increased in frequency. The force and frequency of these expulsive pains are much increased, and though the suffering is extreme, yet is it borne with more patience and cheerfulness. The *cry* to which the female gives vent, during the presence of the pain, is peculiar and

characteristic of the second stage of labour. To render these expulsive efforts more effective, the female brings to her aid all her voluntary powers; she catches hold of whatever she can reach, plants her feet upon anything which is firm, and by thus fixing her extremities, she is enabled to bear down with great effect. When the pain has subsided, the calm repose of the intermission is almost perfect, being very different from that described as occurring between the pains of the first stage of labour. As the pains increase in force and frequency, the presenting part of the fœtus is driven through the os uteri into the vagina, when the agony becomes extreme, and pain after pain occurs in rapid succession, till the fœtus has reached the inferior or perineal strait of the pelvis. By the pressure that the presenting part now exerts upon the rectum and bladder, they often become emptied of their contents; the child is forced down upon the perineum, which after a longer or shorter time begins to yield, is distended and pressed forward; the vulva, in its turn, begins to unfold, and the presenting part may now be seen as far advanced as the external labia. With the subsidence of each pain, however, the elasticity of the perineum, &c., force it upwards, to be driven down again with the renewal of the pain. Finally, the resistance of these parts is overcome, and the presenting part emerges from the vulva. At this time there is a short repose, but soon the pains are renewed, and the rest of the fœtus is delivered.

The Third Stage of Labour.—After the child has been delivered, some few moments elapse before the pains are renewed; but, with the renewal of one or two contractions, the secundines are expelled.

Prognosis as to the Duration of Labour.—There is no subject about which the accoucheur's opinion is so frequently asked, and in reply to which he should be so cautious, as the probable duration of labour. The opinion should always be given with cautious reserve for two very good reasons. 1st, the confidence of the friends of the patient will be much diminished, if the opinion of the accoucheur should prove incorrect. 2d, the incorrectness of the accoucheur's opinion will necessarily cause some apprehension on the part of the patient and her friends, as to the dangers of the case.

The following points will generally, though not always, enable the physician to arrive at a tolerably accurate conclusion as to the probable duration of the labour. 1st. First labours are more tedious than subsequent ones. 2d. Where the pelvis is large, the process is more rapid than where it is small. 3d. The more relaxed the soft parts, the more rapid the labour. 4th. The duration is always modified by the character of the pains. 5th. When the os uteri is dilated, or thick, soft and dilatable, labour will be sooner accomplished, than where it is thin and firm, even though it be somewhat dilated. 6th. If the os uteri be soft and slightly dilated; if the soft parts be relaxed and moist, and if the pains be regular, a speedy delivery may be anticipated. Wigand asserts that the form of the vagina frequently furnishes the means of a pretty certain diagnosis as to the duration of labour: thus, if it be large and yielding throughout its whole extent, the labour will be rapid. If, however, it be small and unyielding throughout, the process of labour will be slow. Again, if the upper portion of the vagina is well dilated, while its lower portion is rigid and contracted, the labour will be rapid during its first half, but protracted afterwards, and *vice versa*. Family predispositions also affect to a certain extent, the progress of labours. In primiparæ, much advanced in life, the process of labour is almost always tedious.

SECTION III. *Mechanism of Labour*.—Before describing the mechanism of labours, it will be necessary to examine the different positions which the fœtus assumes, when at the superior strait of the pelvis.* The most common variety of presentation, is the cephalic, in which case, either the vertex or face occupies at the commencement of labour, the pelvic inlet, hence, the cephalic presentations are divided into two kinds, viz., the vertex and face presentations. The pelvic extremity of the fœtus may also present, and in this case, if, as is usual, the inferior extremities of the fœtus remain flexed upon its body, the breech alone will occupy the pelvic

* In obstetrics, the terms *presentation* and *position* are very different: by the former we mean to express what part of the fœtus, at the commencement of labour, occupies the superior strait of the pelvis; by the latter, we specify the direction which this presenting part assumes, in relation to the circumference of the brim of the pelvis.

inlet. In some cases, however, where this flexion does not exist, either the feet or knees will descend first; but as the mechanism in either case is the same, we will only retain the term pelvic presentation. The presentation of the body of the child will be described under the head of shoulder presentations, since this is the part which almost always offers at the superior strait.

We have now alluded to four varieties of presentations, viz.: the vertex, the face, the breech, and the shoulder. But it must not be supposed, that in every case the presenting part offers directly at the superior strait, since it may, from obliquity of the uterus, &c., be turned more or less to one side, giving rise to a class of presentations which may be termed *irregular*, and which must be regarded as deviations from the primitive or regular presentations, and need not be embraced specially in the classification which we propose to adopt.

Having arranged the presentations under four heads, let us now see how many positions each one of these presentations may assume at the superior strait. Strictly speaking, it might be said that the presenting part of the fœtus might be placed in any position at the superior strait; but to designate so great a number of positions would be practically useless, and would serve to confuse and not enlighten the mind of the student. We shall therefore only specify those positions which have a practical bearing, and into which, all the others may be reduced before labour is accomplished.

In order to convey in language at once concise and specific, the position of the fœtus at the superior strait, we must assume some fixed point of each presenting part, which when associated with a similar point within the pelvic circumference, will specify with accuracy the direction which the presenting part assumes at the superior strait. In obstetrical language, the occiput represents that point for the vertex positions, the mentum for the face, the sacrum for the breech, and the cranium for the shoulder.

To fix similar points of departure within the pelvic brim, let its circumference be divided into two lateral halves, (the one termed the *left iliac*, the other, the *right iliac* portion,) upon each of which, two points may be designated, the one corresponding to the

cotyloid cavity, the other to the sacro-iliac junction. Now in vertex presentations, the occiput will most generally correspond to one or the other of these points, and even where it has a different position originally, it will soon be made to assume this oblique position in the pelvis; in either case there will be no material difference in the mechanism. The same may be said in regard to the other presentations.

By careful reference to the accompanying table, the nomenclature to be employed in regard to the different positions, will be easily comprehended.

1. Vertex Presentation.	Left occipito-iliac	1st position, left occipito-cotyloid.
		2d position, left occipito-sacro iliac.
	Right occipito-iliac	3d position, right occipito-sacro-iliac.
		4th position, right occipito-cotyloid.
2. Face Presentation.	Left mento iliac	1st position, left mento-cotyloid.
		2d position, left mento-sacro-iliac.
	Right mento-iliac	3d position, right mento-cotyloid.
		4th position, right mento-sacro-iliac.
3. Breech Presentation.	Left sacro-iliac	1st position, left sacro-cotyloid.
		2d position, left sacro-sacro-iliac.
	Right sacro-iliac	3d position, right sacro-cotyloid.
		4th position, right sacro-sacro-iliac.
4. Shoulder Presentation.	Left cephalo-iliac	1st position, left cephalo-cotyloid.
		2d position, left cephalo-sacro-iliac.
	Right cephalo-iliac	3d position, right cephalo-cotyloid.
		4th position, right cephalo-sacro-iliac.

Vertex Presentations.—These occur more frequently than any of the other presentations; thus, in upwards of twenty thousand births, Mad. Boivin asserts that more than nineteen thousand were vertex cases. The cause of this frequency, is not positively known, but by most writers it has been attributed to the fact that the head being much heavier than any other portion of the fœtal body, necessarily sinks to the lowest portion of the uterine cavity. Dubois has denied that the greater specific gravity of the head has anything to do with the production of vertex presentations, and attempts to ascribe their frequency to some instinctive action of the fœtus. It will be seen presently, that some of the vertex positions also occur more frequently than others.

Diagnosis.—Frequently before labour has commenced, the presentation of the vertex may be determined by an examination per vaginam. The form and size of the foetal head is such that the lower segment of the uterus receives it with much facility, and its presence at the superior strait is easily detected with the finger, especially if the pelvis be sufficiently capacious to allow the descent of the head, embraced by the uterus, into its cavity. This early determination of the presentation, cannot generally be determined in cases where the breech, face, or shoulder presents, for these parts are large, uneven, and ill adapted to the form of the lower portion of the uterus. After labour has commenced, an examination per vaginam, will detect a round, hard, and even body, and if the finger be pushed far back, between the walls of the uterus and the foetal head, a depressed groove will be encountered, traversing the head almost from one end to the other; this is the *sagittal suture*. The direction which this suture takes, will serve to determine the position of the head. At one of the terminal extremities of this suture, we discover the *posterior fontanelle*, which is a membranous space of a *triangular shape*, in which three sutures terminate, viz., the sagittal, and the two branches of the lambdoidal. The discovery of this fontanelle indicates the direction of the occiput. If now the finger be passed along the sagittal suture, it will finally come in contact with another membranous space of a *lozenge shape*, called the *anterior fontanelle*, which indicates the position of the forehead. From the anterior fontanelle, which is much larger than the posterior, three sutures may be traced, viz., the sagittal, the coronal, and the frontal. Another means, which has lately been applied to the determination of the presentation, is the auscultation of the foetal heart. In vertex cases, if the pulsation be heard in the region of the left iliac fossa, the occiput will be found to the left side of the pelvis, and vice versa.

The presentation of the foetus may sometimes be detected by careful examination through the abdominal parietes.

Of the four presentations we have admitted for the vertex, some occur much more frequently than others; thus, Dubois states that in 1913 cases, there were of the left occipito-cotyloid 1339; of the

right occipito-sacro-iliac 494; of the right occipito-cotyloid 55, and of the left occipito-sacro-iliac 12. The presence of the rectum in the posterior part of the left lateral half of the pelvis, renders the two latter positions exceedingly rare; but it is impossible to explain why the left occipito-cotyloid should occur more frequently than the right occipito-sacro-iliac.

Besides these four positions, some authors still retain several others, viz., the occipito-pubic, the occipito-sacral, and the transverse positions; but these are exceptional cases, and if any difficulty occurs in the delivery, they should be converted into one of the oblique positions to which we have alluded. In order to comprehend, perfectly, the mechanical phenomena of the four vertex positions, it will be necessary to describe, 1st, the mechanism of the right occipito-cotyloid position; and 2d, the mechanism of the right occipito-sacro-iliac position.

1st. The mechanism of the *right occipito-cotyloid position*. In this case the occiput is directed towards the right cotyloid cavity, and the forehead to the left sacro-iliac symphysis. The posterior fontanelle is in front, and to the right of the symphysis pubis; while the anterior, if not too elevated to be felt, (which will depend upon the degree of flexion of the child's head,) is found near the left sacro-iliac symphysis. The sagittal suture may be traced, traversing the pelvis obliquely. The anterior face of the body of the child looks towards the left sacro-iliac junction, while its dorsal surface is turned towards the right cotyloid cavity.

Before much flexion has occurred, the relation of the diameters of the head to those of the pelvis, are as follows:—the occipito-frontal corresponds to the right oblique diameter of the pelvis, and the bi-parietal to the left oblique diameter of the same. The occipito-frontal circumference, is parallel to the circumference of the superior strait. The axis of the pelvic brim traverses the trachelobregmatic diameter of the child's head.

By Nægèle and Dubois, it is thought that the occipito-frontal circumference is not, in a majority of cases, parallel to the plane of the superior strait, and that the anterior parietal protuberance is lower down than the posterior. That this obliquity of position may exist, cannot be doubted, but in a majority of cases we think the description above given is the most correct.

When the waters are discharged, the uterine contractions act with increased force, and the head is forced down into the pelvic brim. If, at this point, much resistance is offered to its passage through the superior strait, the head becomes forcibly flexed upon the body, so that the chin is thrown up against the breast of the child. This constitutes *flexion*, the object of which is to bring the occipito-bregmatic diameter into coincidence with the right oblique diameter of the pelvic inlet. The bi-parietal diameter still lies in the direction of the left oblique pelvic diameter, and the occipito-bregmatic circumference corresponds to that of the superior strait. The axis of the superior strait will traverse some point intermediate between the trachelo-bregmatic and occipito-mental diameters. The effect of this movement of flexion, is to change the position of the head, so as to bring a smaller circumference of the child's head into correspondence with the circumference of the superior strait.

Fig. 12.



After flexion has been accomplished, the head is forced by the labour-pains through the pelvic excavation to the lower strait of

the pelvis. This constitutes the *descent* of the head, during which the parts within the pelvis undergo very great pressure. The descent of the head may be regarded as completely accomplished, when the occipito-bregmatic circumference is brought parallel to the circumference of the perineal strait, but to effect this it is evident that the posterior parietal bone must traverse the whole depth of the posterior part of the pelvis, while the anterior traverses a much shorter distance.

The head of the child is now arrested in its progress by the muscles, &c., which form the floor of the pelvis. This resistance is gradually overcome by the uterine contractions, during which the head is *rotated*, so that the occiput lies under the symphysis pubis,—the sagittal suture is parallel with the antero-posterior diameter of the inferior strait of the pelvis; and the forehead lies in the hollow of the sacrum. The posterior fontanelle may be felt in the centre of the pubic arch, while the anterior points towards the hollow of the sacrum. The pressure upon the head has been so great as to give rise to the existence of a tumour upon the scalp, called the *caput succedaneum*, and the bones are now found to overlap, forming ridges by which the presence of the sutures may be detected (see fig. 12, above). Under the continual influence of the uterine contractions, rotation is completed, and the occiput has now passed the inferior edge of the symphysis pubis, and can be seen making its escape from the vulva; when this has been accomplished, the back of the neck of the child becomes fixed against the pubis, and ceases to advance until, as we shall see presently, the rest of the head has been delivered.

The force of the expulsive efforts is now directed, not upon the neck, which is for the time fixed immovably against the pubis, but upon that portion of the head which lies in the hollow of the sacrum; and the effect is such as gradually to extend the head. After rotation has been effected, and before extension has commenced, the position of the head, in regard to the diameters of the inferior strait, is as follows: the occiput having partially escaped, the sub-occipito-bregmatic diameter of the child's head corresponds with the antero-posterior diameter of the lower strait, and the bi-parietal diameter, with the transverse diameter of the infe-

rior strait. It will thus be seen, that the movements of flexion, descent, and rotation, have for their object the constant correspondence of the small diameters and circumferences of the child's head, with the large diameters of the pelvis; and the fact that the *neck*, and not the *occiput*, becomes fixed against the symphysis pubis, gives additional space for the delivery of the forehead, face, and chin, since, if it were not for this arrangement, during the delivery of these parts, the occipito-frontal and occipito-mental diameters would be obliged to pass through the antero-posterior diameter of the inferior strait. This will be better understood by reference to fig. 12, p. 175, in which the head is represented at the inferior strait, and after rotation has been accomplished.

During *extension*, the chin of the child leaves the breast, the face sweeps over the hollow of the sacrum, and the forehead, face, and chin pass in succession over the posterior commissure of the vulva, and the delivery of the head is accomplished (see fig. 13).

Fig. 13.



Very shortly after the head is delivered, as has just been described, another movement of the head occurs, which has been termed *restitution*. This movement consists in a restoration of the head, after it emerges from the pelvis, to its original oblique position, so

that the face of the child, in the mechanism just described, turns towards the left thigh of the mother (see fig. 14). This restitution was formerly supposed to have been effected entirely at the

Fig. 14.



expense of a torsion of the neck of the child ; but the observations of Gerdy have shown that this torsion does not always occur during the rotation of the head, but that as the head rotates, the body of the child undergoes a similar movement, so that the bis-acromial diameter, which, previous to rotation, corresponded with the left oblique diameter of the pelvis, becomes placed transversely : but when the shoulders reach the inferior strait, they rotate towards the symphysis pubis ; and it is this subsequent rotation of the shoulders which turns the face, after its expulsion, to one or the other side of the mother. In the mechanism which we are describing, the left shoulder is placed behind the left cotyloid cavity, previous to the rotation of the head ; but, after this movement has been accomplished, the bis-acromial diameter becomes parallel to the transverse pelvic diameter, the left shoulder being placed to the left side of the pelvis, &c. In this position, the shoulders are by the uterine contractions driven through the pelvic excavation ; but

at the lower strait they begin to rotate, so that the left shoulder is turned round towards the symphysis pubis, while the right one falls into the hollow of the sacrum. The shoulder which lies in front, (the left in this instance,) first makes its appearance under the pubic arch, and becomes fixed in that position; and the shoulder placed posteriorly, is by the force of the labour-pains made to sweep over the hollow of the sacrum, over the perineum, when its delivery is accomplished. After the shoulder, which is placed posteriorly, has been delivered, the one placed under the pubic arch is expelled. During the delivery of the right shoulder, the body naturally undergoes a lateral incurvation, which throws the head of the child upwards towards the mons veneris; but when this has been accomplished, the body of the child is pressed back against the perineum, for the purpose of allowing more space for the delivery of the left shoulder. After the shoulders have been delivered, the body of the child is easily expelled; and in its passage out, it describes a spiral movement more or less marked. In some cases, the shoulder, which is placed anteriorly, is first delivered, but the general rule is such as we have stated.

2d. *The Mechanism of the Right Occipito-sacro-iliac Position.*

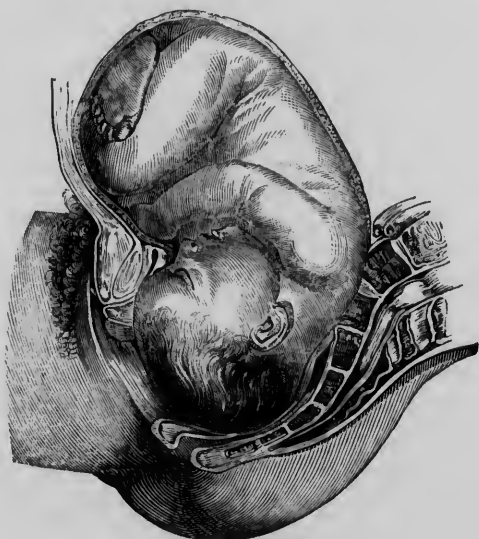
—In this case, the occiput is placed in front of the right sacro-iliac symphysis, and the forehead behind the left cotyloid cavity. If an exploration per vaginam be made before the head has been much flexed, the occipito-frontal diameter will be found to correspond to the left oblique pelvic diameter. The sagittal suture lies parallel with the oblique pelvic diameter, and at each of its extremities may be felt the two fontanelles; in this case, the anterior fontanelle is usually most easily reached, as it lies towards the anterior part of the pelvis. The occipito-frontal circumference offers to the circumference of the pelvic brim.

The flexion of the chin upon the breast of the child is effected in the way already described; and the relative bearing of the head becomes changed: the occipito-bregmatic diameter corresponds to the left oblique pelvic diameter; the bi-parietal to the right oblique; and the occipito-bregmatic circumference offers to the inlet of the pelvis, while the axis of the superior strait runs nearly in the direction of the occipito-mental diameter of the head. As the head

becomes flexed, the anterior fontanelle rises, while the posterior descends, and approaches nearer the centre of the pelvis.

The descent of the child's head through the excavation, is accomplished as in the mechanism already described; and it is at this point that the peculiarities of the mechanism of the posterior occipital positions are observed. But there are two ways in which these labours are terminated: 1st. When the head has arrived at the inferior strait of the pelvis, the occiput may rotate into the hollow of the sacrum, while the frontal bone will become fixed behind the symphysis pubis, (see fig. 15,) and the occipito-frontal diameter will offer to the antero-posterior diameter of the inferior

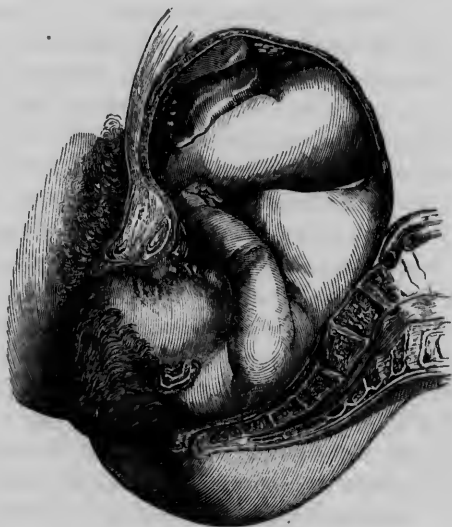
Fig. 15.



strait, the bi-parietal diameter will be transverse, and the occipito-frontal circumference will correspond to the circumference of the inferior strait. The anterior face of the child will be directed to the anterior part of the uterus, while the bis-acromial diameter will be placed transversely. As the uterine pains continue, the flexion of the head will be increased, and the occiput forced by

degrees to traverse the curve offered by the sacrum, coccyx and perineum, until it finally slips over the posterior commissure. As this progress of the occiput is being effected, the frontal bone, which was originally placed behind the symphysis pubis, rises up, so as to afford more space for the passage of the head. Sometimes, however, the forehead has descended so low, that the eyebrows may be felt; this occurrence is very liable to increase the difficulties of the delivery. When the occiput has passed the posterior commissure, (see fig. 16,) either the occipito-frontal or the occipito-

Fig. 16.



bregmatic diameters offers to the antero-posterior diameter of the inferior strait; but, as the delivery progresses, the neck becomes firmly fixed against the perineum, and the force of the pains now falls upon the anterior part of the head, and soon effects the passage of the forehead, face and chin. In this case, when the head has been delivered, restitution takes place, and the face of the child turns to the left thigh of the mother.

The shoulders are now placed transversely, and the left shoulder, which was originally placed anteriorly, is rotated under the

arch of the pubis, while the right shoulder falls into the hollow of the sacrum. The left shoulder first makes its appearance under the symphysis pubis, but it is the right or posterior shoulder, which is generally first delivered; the rest of the body is expelled in the usual manner.

In this mode of delivery, it sometimes occurs that the occiput is caught in the hollow of the sacrum, and is prevented from descending; in this case, the face is brought down, and the delivery takes place, as in face-presentations. 2d. There is another way, in which this posterior occipital position is delivered: and this, according to Naegèle, Dubois, Rigby, &c., is the most frequent of all. The mechanism is as follows: when the flexion and descent of the head has been effected, the occiput, instead of rotating into the hollow of the sacrum, is carried round to the symphysis pubis, when the delivery is accomplished as if it had been an original anterior occipital position. This excessive rotation of the head, of course implies a similar rotation on the part of the body of the child; and it must be remembered that the time required for such a movement, will necessarily be long and tedious. When, however, this difficult rotation has been accomplished, the labour proceeds very favourably, and the left shoulder, which has been rotated to the left side of the pelvis, is soon brought under the symphysis pubis, while the right one is thrown into the hollow of the sacrum; and the subsequent delivery is effected as usual.

The difficulties incident to the posterior occipital positions are considerable: 1st. The forehead is in front, and does not present a surface so accurately adapted to the form of the anterior part of the pelvis. This difficulty is however overcome in the immense majority of cases, by the occurrence of the extreme rotation of which we have spoken. 2d. As the forehead does not fit so accurately the arch of the pubis, it is obliged to remain behind the symphysis pubis, thus requiring excessive flexion, in order that the occiput may be first delivered; this difficulty is also surmounted by the occurrence to which we have already alluded.

In all the other positions of the vertex, the mechanism is the same as in the two varieties which we have described; and even if we admit the occurrence of the transverse, or the antero-poste-

rior positions of some authors, the mechanical phenomena of the labour are not materially changed.

There are some peculiarities connected with the different movements which take place in the mechanism of these vertex presentations, which will require some special notice. 1st, as to the *flexion* of the head, it must not be supposed that this movement always occurs previous to the descent of the head, since in a majority of cases, it is not accomplished until the head has reached the floor of the pelvis. This will be easily comprehended, when we reflect that when the pelvis is well formed, the head is frequently found low in the excavation, some time previous to labour, in which case the flexion is very slight, and the head offers its occipito-frontal circumference to the circumference of the pelvic excavation; but as soon as the pains commence, the flexion is increased, and the relative position of the diameters of the child's head become changed. If an examination be made before the occurrence of extreme flexion, the fontanelles will be found on very nearly the same level, but very distant from the centre of the pelvic excavation; in fact, contrary to what is usually asserted, the anterior fontanelle approaches nearer the centre of the pelvis than the posterior. In some cases, when the superior strait of the pelvis is narrow, or the head very large, the latter does not enter the pelvis until the labour pains have continued for some time, and even then, it requires such a flexion of head upon the body of the child, as will bring the smaller diameters of the head into correspondence with the long ones of the pelvis. In other cases this flexion is prevented, and in consequence of this the face or forehead will present.

2d Rotation.—This is one of the most curious phenomena of the mechanism of labour, and by some is supposed to depend upon the direction of the inclined planes of the pelvis; but more accurate observation shows, that in a majority of cases, this movement occurs when the head has reached the inferior strait of the pelvis, and indeed, a fact reported by Cazeaux, proves that it may be deferred, even until the head has almost passed the posterior commissure of the perineum. In some cases, however, the rotation may be effected much sooner, even while the head is at the upper

part of the pelvic excavation. It has been observed by Dubois and others, that the rotation in the posterior occipital positions is sometimes so great as to carry the occiput not only to the symphysis pubis, but *even beyond, to the acetabulum* of the opposite side. It is almost impossible to explain the cause of this rotation, but it may be attributed to a combination of circumstances, viz., to the volume, form, and mobility of the fœtal head, as well as the form and capacity of the pelvis.

In some cases, this rotation may not take place at all, or it may be incomplete, so that the head will present either transversely or obliquely at the inferior strait. The delivery in these cases will be rendered somewhat tedious, but will usually be accomplished without any assistance on the part of the accoucheur. The same remark may be made in regard to the position of the shoulders at the inferior strait.

The prognosis, in vertex presentations, is usually favourable, though it must be remembered that these, like every other form of presentation, may be accompanied by any of the accidents which sometimes complicate labour. The anterior occipital positions are more favourable than those in which the occiput is placed posteriorly.

CHAPTER X.

SECTION I.—Having described the mechanism of the vertex presentations, we must make a few remarks upon the duties of the accoucheur, when called to a female in labour.

1st. When the physician is called to a case of labour, it is his duty to obey the summons as speedily as possible, since his presence may be required at the very commencement of labour, because of the rapidity of the process in some cases, or of the occurrence of accidents, &c.

2d. When the accoucheur has arrived at the house of his patient, he should not enter the room without being previously announced. This is a very necessary precaution, especially with over-fastidious females, who are desirous of making some little arrangements previous to the admission of the physician into her room. In some cases also, the female is very averse to the presence of the physician, and it is better that her objections should be removed by her female friends, than by the physician himself.

3d. When in the presence of your patient, it will be best to engage her in some little conversation, in order to distract her mind, and to remove the embarrassment under which she is labouring. If, during the conversation, a labour pain should occur, you will be able to determine the character of the pain, the probable advance of labour, and the necessity for making an examination. The bowels should be evacuated by castor oil, or an injection, if there be not time for the operation of the oil.

4th. If a vaginal exploration be desired, the wish should be made known through a third person. If objection should be made, do not press the point, unless there be an absolute necessity. When this exists, however, your course should be gentle, and firm, and you should represent to the patient, that her safety, and that of her child, may depend upon an early examination.

5th. By an examination per vaginam, you will ascertain whether pregnancy exist; whether labour has really commenced; what progress it has made; what is the presentation, and whether the membranes have been ruptured or not. 1st. As to the existence of pregnancy, we have already detailed the signs of pregnancy, and need only refer to the chapter on that subject. 2d. Has labour really commenced? Towards the latter end of pregnancy, every pain is not to be regarded as evidence of the commencement of labour, since females, at this time, are subject to a species of pain termed "false pains," dependent upon intestinal irritability, rheumatism of the uterus, congestion of this organ, &c. &c. The diagnosis may be determined by referring to the character of true labour pains; these are regularly intermittent, and confined to the region of the uterus; during their continuance, the uterine globe becomes hard and contracted; the os uteri is also affected during their existence; the membranes become tense, and the presenting part advances somewhat during the contraction of the uterine globe. Wigand asserts that the contraction in a true labour pain, commences at the uterine neck and proceeds upward until all the fibres of the body of the uterus are involved. Hence it is, that when the pain first comes on, the presenting part is elevated, because the size of the lower segment of the uterus is lessened; but so soon as the fibres of the fundus uteri begin to contract, *it* is forced down, and may be felt by the finger in the vagina.

Where these false pains do exist, their treatment will consist in the moderate use of purgatives, if dependent upon intestinal derangement. Venesection, anodynes, and laxatives, will be required, when we have reason to suspect the existence of rheumatism, congestion of the uterus, &c. &c.

The existence of labour may be detected as follows:—where pain exists; where the uterine globe hardens during these pains; where the os uteri dilates during the absence, and contracts during the presence of a pain; where the bag of waters is tender, tense, and protrusive, during the contractions of the uterus, &c. &c., labour may be said to have commenced.

3d. What progress has the labour made? This may be detected only by an examination per vaginam, where the degree of dilata-

tion of the os uteri will be our principal guide. If it be entirely closed, and the pains be slight and infrequent, the labour is but little advanced; where the reverse state of things exists, we may conclude that considerable progress has been made.

4th. What is the presentation? When the presenting part is low down in the pelvis, and feels round and hard through the uterine walls, we may infer that the head occupies the pelvic excavation, even though the os uteri is not dilated. If, however, notwithstanding the uterine contractions, the presenting part is not made to descend, a presentation of some other portion of the fœtus may be anticipated. Mad. Lachapelle says, that the character of the bag of waters will guide us in this matter; when they are flat, the head most usually presents; when the os uteri has become dilated, our means of diagnosis are rendered more certain, since, if the finger be inserted through this opening, the portion presenting may be easily detected, provided it can be reached. There is very little use in making an examination for the purpose of detecting the presentation previous to the dilatation of the os uteri; but where this has been fully effected, especially if the bag of waters be ruptured, not only the presentation, but the position of the presenting part may be detected by the diagnostic points to which we have already alluded. Our diagnosis will be rendered still more positive when the presenting part has protruded through the os uteri into the vagina.

5th. How is it ascertained whether the membranes have been ruptured? The evidence of the patient and the bystanders will usually be sufficient to satisfy us on this point. But where this cannot be obtained, it is not always easy to determine; for if an examination be made during the absence of a pain, when the head presents, no protrusion will exist, and the membranes will be in close contact with the presenting part; but during the pain, the formation of the bag will commence, and the integrity of the membranes may then be detected. In those cases where other portions of the fœtus presents, the size of the protruding membranes will be more marked. Where the head is low down, it is very difficult to detect the bag of waters, since but little of the amniotic fluid can be insinuated between the head and

the membranes. The presence of the hair on the head of the fœtus of course will guide us in this matter, determining whether the membranes have been ruptured or not; and the sebaceous matter with which the exterior of the fœtus is covered, gives to the finger, a sensation in striking contrast, with the polished, but not slippery feeling of the membranes.

6th. The life of the fœtus in utero may be determined either by its own movements, by the presence of the pulsation of the heart, or by the character of the *caput succedaneum*. This tumour may be felt whether the fœtus be dead or not; but where life still exists, the tumour formed during the pain disappears almost immediately after the cessation of the contraction. This is not observed where death has taken place, since the contractile power of the blood-vessels being lost, the subsidence of the congestion of the scalp is impossible.

7th. *Mode of making an examination per vaginam.*—In an exploration per vaginam we have two objects in view: first, to know what progress labour has made; second, to discover the position of the presenting part. The first point has already been discussed, and it now remains to consider the most favourable moment for determining the position of the child. It is impossible to ascertain the position previous to the dilatation of the os uteri, nor is it important that we should be able to do so, since no artificial interference could be effective at this time. After the os uteri has been dilated sufficiently to admit the ends of one or two fingers, it will be possible, with great care and experience, to detect the position of the presenting part; but by far the most favourable moment for ascertaining the position, is after the full dilatation of the mouth of the uterus and the rupture of the membranes. A knowledge of the position at this time is of the utmost importance, because, if any interference be required, this is the most favourable period for its execution.

In making an examination, the female should be placed on her left side, with the hips close to the edge of the bed, the abdomen facing a little downwards, and the body so flexed as to bring the shoulders and knees near to each other. Every physician should learn to touch with either hand, though in this case, the left is

most conveniently employed. Before touching, the hand should be well anointed with fresh lard or butter; when this has been done, the index and middle finger should be introduced into the vagina, and be carried upwards and backward until the os uteri is discovered, when its condition must be accurately examined. After this has been done, the fingers should be insinuated into the opening, so as to be brought in direct contact with the presenting part, the diagnostic points of which, may now be accurately examined. Some persons recommend the introduction of one finger only, others of the whole hand in the vagina, but we feel confident that a more perfect and comprehensive exploration may be accomplished in the way which we have described. Where the soft parts are rigid and tender, it may be necessary to relieve them previous to making the examination by venesection and opiates. The examination should be made during the absence of the pains, and the greatest gentleness should be used, the physician always taking care that his finger nails should not injure the soft parts. The examination should be made as rarely as possible; only to ascertain the position and the progress which the labour is making.

8th. If upon examination the labour is found to have made but little progress, the physician need not remain in the room, and might probably be permitted to leave the house for the purpose of attending to other business. Be cautious on this point, for sometimes the dilatation proceeds very rapidly, and the delivery may be effected before the return of the accoucheur. If the pains are not active, and if the os uteri is not dilated, it may be inferred that some time will elapse before labour is accomplished. When the pains are active, and the soft parts well dilated, the accoucheur should on no account leave the house of the patient, more especially if the presentation be bad.

9th. Be careful in making promises as to the duration of labour. We have already stated what signs indicate rapid deliveries, &c.

10th. Before the complete dilatation of the os uteri, and the discharge of the waters, the patient may be allowed to sit or walk about, as she may feel disposed, but where the second stage of labour has commenced, the recumbent position should be impera-

tively required. The state of the bladder must be attended to, and the urine, if necessary, must be drawn off by means of the catheter.

11th. The room of the patient should be kept cool and comfortable. Her clothing should be light, and the diet should consist of tea, gruel, and cold water. All stimulating drinks should be prohibited, unless urgent reasons for their use should arise.

12th. It is important that the physician should know how the bed should be made. A blanket twice doubled is to be placed over the under sheet, at that part of the bed upon which the female will lie during labour. Under this blanket a piece of oil-cloth may be laid so as to protect the bed from the discharges. When this has been done, the patient should be placed on her left side at the foot of the bed, so as to enable her to fix her feet against the bedpost; her hips should be brought within a few inches of the edge of the bed; the body should be well flexed upon the thigh, so as to bring the head towards the centre of the bed. A towel, or sheet, attached to the opposite bedpost, will serve as a fixed point upon which the patient may pull. After having given the above directions, the physician should leave the room until the patient has been fixed.

13th. All these matters being arranged, the natural progress of labour, should be patiently waited for. When the os uteri is fully dilated, the question arises as to the propriety of rupturing the membranes. Blundel's oft-repeated aphorism "that meddling midwifery is always bad," should never be forgotten, and unless some accident should occur requiring interference, the rupture of the membranes should not be attempted until the os uteri is fully dilated or dilatable. When this condition of the soft parts exists, the membranous bag has fulfilled its office of aiding in the dilatation of the os uteri, and to defer the rupture to a later period, is only calculated to wear down the patient by needlessly protracting the delivery. As soon as the waters are evacuated, the pains increase in force and frequency, and if the os uteri be dilated, the expulsion of the child will soon follow. By rupturing the membranes at the proper time, the patient will run less risk of uterine hemorrhage.

14th. When the presenting part is about emerging from the outlet, the accoucheur is called upon to perform one of the most important duties, viz., the support of the perineum during the entire passage of the child over this part. If the passage of the child over the perineum be gradual, there is very little danger of laceration, provided the proper support be given; but where the expulsive efforts are powerful, and the soft parts rigid and resisting, the greatest danger is to be apprehended, and injury frequently results notwithstanding every effort on the part of the physician. In this case it is his duty to direct the patient to abstain, as much as possible, from all voluntary bearing down efforts, at the same time that he uses every effort to protect, with his hand properly applied, the soft parts, and to prevent, if possible, the passage of the child, until these parts are sufficiently unfolded and yielding.

In every case, the perineum should be properly supported, or its laceration will be inevitable. This support is to be given by placing the palm of the hand firmly against the perineum, retaining it there until the delivery is finished.

15th. After the presenting part has been delivered, no traction should be made to hasten the delivery of the rest of the body. This must be left to the natural efforts unless some accident should occur, and the support of the perineum should be continued until the whole body has been expelled.

SECTION II.—When the child has been expelled, it will be proper to examine the condition in which it is born. If it breathe and cry aloud, when delivered, we may proceed immediately to tie the cord. A ligature of very narrow tape or bobbin, must be applied within about an inch of the umbilicus. It will be necessary to draw this ligature sufficiently tight to arrest the circulation of the blood through the cord. After this has been done, the cord must be cut about an inch or two from the ligature. The mode of dressing the cord will be explained hereafter. In applying this ligature, the accoucheur should be careful to ascertain that no portion of intestine is included within it, for it sometimes happens that a congenital protrusion of the gut takes place, and if the ligature were applied incautiously, the most disastrous consequences would result. That

portion of the cord which is external to the ligature, sloughs off in a few days.

If the child should not breathe after birth, the pulsation in the funis still continuing, it will be best to wait a short time to see if respiration will not be established. When this does not take place soon, however, it will be necessary to cut the cord and proceed to the means, necessary to the resuscitation of the child.

The child may be born in a feeble, relaxed condition. If, in this case, the cord still pulsate, the danger is not very great; all that is required will be to remove the mucus from the mouth and fauces, and to sprinkle the body either with cold water or brandy. Where, however, the cord has ceased to pulsate, the case is almost desperate. In order to resuscitate the child, the mucus must be removed with the finger, and artificial respiration established. The mode of exciting artificial respiration is to apply the mouth of the physician, to that of the child, so as to fill the lungs, if possible, with air; and then, by depressing gently the thorax, an imitation of expiration may be attempted. These efforts should be persevered in for some time, and at the same time heated cloths, warm bath, &c., should be tried. A short sob will be the first sign indicative of returning life, which becoming more and more frequent, will end in the establishment of respiration. When this fortunate result has been attained, all fatigue to the child should be avoided, while the body is maintained at a sufficiently elevated temperature.

The child, in some cases, is prevented from breathing by the existence of mucus in the fauces. This case must be treated by passing the finger into the mouth, and as far down as possible, so as to remove the mucus which obstructs respiration.

But the child, from long delay in delivery, or from strangulation with the cord, may be born black and livid in the face; the cord may or may not have ceased to beat. In this case nothing will save the child but the abstraction of blood, and this may be effected by allowing the cut cord to bleed. The other means of resuscitation must also be resorted to.

SECTION III. *Delivery of the Placenta.*—If the uterine contractions are active, the secundines are delivered in a very few moments after the expulsion of the child. Most usually the contractions

cease for fifteen minutes, or thereabouts, to be again renewed with sufficient force to expel the placenta, either into the upper part of the vagina, or entirely out of the genitalia. In other cases it is partly within and partly without the cavity of the uterus.

The contractions of the uterus, after the delivery of the child, are essential to the safety of the mother; and effect, 1st, the detachment of the placenta; 2d, its expulsion either from the uterus or vagina; 3d, the prevention of uterine hemorrhage, when the placenta has been detached; 4th, the prevention of *inversio uteri* when the cord is pulled for the purpose of delivering the placenta. These are points which the accoucheur should ever bear in mind, for upon these rests his ability to manage the most difficult part of labour, viz., *the delivery of the placenta and the prevention of hemorrhage*.

It sometimes happens that the placenta is retained within the cavity of the uterus, and the question arises whether its delivery should be interfered with, and what is the proper moment for such interference? On this point obstetricians by no means agree. Hunter, Ruysch, and Denman, seeing the evils attendant upon inappropriate interference in this matter, laid down the rule that the delivery of the placenta should be left entirely to the natural efforts. So positive a rule will be found inapplicable in many cases, since it is frequently necessary for the accoucheur to assist nature, when her powers are inefficient, and to substitute artificial for natural means, when the latter cease to act.

We shall proceed to examine, in detail, the causes of retained placenta, and lay down the treatment applicable to each case.

Retention of the placenta may be occasioned by want of contractile power in the uterus, or by too firm adhesion to the uterine parietes, or by the irregular contraction of the uterus, usually termed the *hour-glass* contraction. In order to form a correct conclusion in regard to this point, it is all-important to ascertain the condition of the uterus, immediately after the delivery of the child. The uterus, when explored through the abdominal walls, will be found in one of the following conditions: 1st, large and soft; 2d, small, but soft; 3d, small, but at one moment hard, and at another soft; 4th, small and hard. The last condition of the uterus is truly in-

dicative of the safety of the mother ; but the others are fraught with much danger, though they frequently do, when well managed, terminate favourably. When the uterus is hard and small, it may be felt through the abdomen, about the size of the fœtal head, and exceedingly firm. In other cases, though sufficiently contracted, its texture seems so soft *to the touch*, that no confidence can be placed in the durability of its contraction,—hence the danger in these cases. But if the organ be uncontracted and soft, so that no tumour can be felt through the abdomen, the danger from hemorrhage, and inversion is imminent, and every effort will be required to rouse it to action. These means, as we shall see hereafter, will consist in frictions over the abdomen, cold applications, ergot, galvanism, &c.

If the uterus be well contracted, if we can feel the insertion of the cord into the placenta, and if the whole placental mass can be surrounded with the finger, it may be inferred that the placenta is extruded from the uterus, and lies within the vagina, from which it may be drawn by traction upon the cord.

If, however, the uterus be not well contracted, and the insertion of the cord cannot be felt, then it may be concluded that the placenta is still attached to the internal surface of the uterus, and no attempt should be made upon the cord, for the purpose of detaching it, lest hemorrhage or inversion result. In this case, we should do nothing, till the organ has been made to contract. Again, if the insertion of the cord and the division of its vessels into the body of the placenta be detected with the finger, we will not be justified in concluding that the placenta is detached, so long as the uterus is in a non-contracted condition, since it sometimes occurs that the placenta presents a battledore shape. In this case, traction upon the cord would be inadvisable. The better treatment, where the placenta is undetached and the uterus uncontracted, is first to induce the uterine contractions, which will soon cause the expulsion of the placenta ; and if they fail to do so, traction upon the cord may be resorted to, with success. How are the uterine contractions to be excited ? Frictions over the abdomen ; kneading the uterus through the abdominal walls ; cold applications, either by placing cold wet cloths over the belly, or by pouring water

from a certain height upon the abdomen, as is recommended by Gooch. The use of ergot, galvanism, and some stimulating drinks will be found serviceable. When these contractions have been roused, the delivery of the placenta may be hastened by traction upon the cord. If hemorrhage should occur, either from the total or partial detachment of the placenta, and we should fail to induce a contraction of the organ, the hand must be introduced into the uterine cavity, for the purpose of detaching the placenta, and of inducing, by its presence, a contraction of the uterus. Dewees says: "The time for the interference of the accoucheur, for the delivery of the placenta, should always be regulated by the condition of the uterus itself, and that condition is whenever it is firmly contracted. * * * * For the uterus may be disposed to throw off the placenta; and it would do so, if properly aided, long before the fixed period may arrive, or it may be in a state of such feebleness at that period, as to render it highly dangerous to attempt it; hence, on the one hand, an injury may be done to the uterus by the manual delivery of the placenta, by the resistance which it now offers to the attempt, or the woman may be exposed to a severe and fatal hemorrhage, by our acting at limited periods."

When we wish to remove the placenta from the uterus, the hand must be introduced into the uterine cavity, and searching for the point of its attachment to the internal walls, the fingers must be insinuated under the placenta, when the separation may be accomplished, just as the peel is removed from an orange, unless there be some morbid adhesion. When the placenta has been separated, it may be either drawn out with the hand, or pushed out before it.

When the placenta is morbidly adherent, a different course must be pursued; the induction of uterine contraction, the traction on the cord must first be tried; and if this be done patiently, the withdrawal of the placenta may sometimes be successful, notwithstanding its morbid adhesion. In these cases, we may ascertain whether the placenta is advancing or not, by relaxing our hold upon the cord, when, if it remounts, you may be sure that the placenta is not detached; if, however, the funis should not remount, when relaxed, it will serve to show that the placenta is descending.

More frequently, in morbid adhesions of the placenta, it is

necessary to introduce the hand, and peel off the placenta; this should be done gently, and no risk should be run of lacerating the uterine texture. When much force is required, every attempt at the removal should stop, and the case left to nature, since it is clearly proved by the report of many cases, that this may be done frequently without injury to the mother. When, from the force of circumstances, the placenta is left within the uterine cavity, the case will terminate either by the discharge of its whole mass, in the course of twenty-four hours, or the placenta may be gradually discharged in a putrefied condition, or the adherent portion may disappear without injury to the mother, and without occasioning any unpleasant discharge from the uterus. In the first case, it is probable that the extrusion of the placental mass has been occasioned by the continued uterine contraction, at the same time that the morbid adhesion has been broken up by an incipient putrefaction. In the second case, when the placenta is discharged in a putrid condition, irritative fever has been excited, and the death of the patient frequently is the consequence; the pulse becomes quick and small; the tongue red and dry; the vital powers are much depressed; the uterus becomes hard, inflamed and painful; the abdomen is tympanitic, and the patient finally falls a victim to this irritative fever and inflammation. In the last mode of termination, alluded to above, the adherent placenta is absorbed, without undergoing putrefaction. Cases of this kind have been observed by many physicians. A case is recorded by Prof. Salomon of Leyden, where the *whole* placenta of a child within three weeks of full time, was retained within the uterus, and afterwards removed by the process of absorption. Another case is recorded by Dr. Young of Edinburgh, who says: "I could get my hand to the placenta, but no farther, the uterus having formed a kind of pouch for it, so that I at last was obliged to trust to nature; and what was very remarkable, the placenta never came away, yet the woman recovered." Some authors have recorded cases, in which the whole placenta has been expelled quite fresh, after having been retained in the uterus for many days; in Denman's case, until the fifteenth day after the delivery. Other cases are recorded by Naegèle, &c., and Dr. Villeneuve of Marseilles has shown, that cases of total adhesion are rarely fatal; and when fatal, he says the placenta

was partially detached, and that death was caused either by hemorrhage, or by the absorption of the putrid fluids furnished by the detached portions, and not by those which were firmly adherent. This would serve to warn us against leaving any undetached portions of placenta in the uterus. When evil effects arise from the putrid condition of the placenta, the constitution must be supported by stimulants, good diet, &c., and the uterus should be syringed frequently, so as to keep the parts as clean as possible.

Encysted Placenta.—By this term we mean a firm contraction of the lower part of the uterus, by which the placenta is retained in the cavity of the fundus uteri. This condition of things is produced either by a contraction of the os uteri, or by that of the cervix uteri, or by that of the os internum. This variety of retained placenta may be recognised by the elevated, though contracted condition of the fundus uteri, by the funnel shape which the neck of the womb assumes, when the stricture is seated at the os internum or in the cervix uteri, and by the rigid condition of the os uteri when its fibres are morbidly contracted. The mode of management, here, consists in inducing uterine contractions, and during their existence, gradual traction on the cord must be kept up. If these means should fail, the hand must be carefully introduced into the cavity of the uterus, for the purpose of extracting the placenta. If, owing to the very rigid condition of the lower fibres of the uterus, the hand cannot penetrate into the cavity of that organ, it will be necessary to resort to copious venesection, which, together with the use of opium, has a powerful effect in overcoming the morbid contractions of muscular fibres.

When the placenta is detached, it sometimes becomes fixed over the os uteri, occasioning, if the uterus be not contracted, internal hemorrhage, which will be treated of hereafter.

After the secundines have been delivered, and when the uterus is well contracted, the bandage must be applied, so as to compress the abdomen and retain in its contracted condition, the *globus uterinus*. All the wet clothes should be removed, and the patient shifted to a dry part of the bed. She must then be placed on either the right or left side, with the head moderately elevated with pillows. A cloth must be applied over the genital fissure, not to

act as a tampon, but simply to prevent the discharges from soiling the dry clothes of the patient. It will be necessary to examine this cloth from time to time, to ascertain the amount of blood which is escaping.

The patient should be positively prohibited from raising herself in bed for some hours after delivery, for fear of inducing flooding. These arrangements after delivery, constitute what is called "putting to bed." This putting to bed may be arranged, if the uterus be well contracted, if no flooding exist, and if the patient be not much exhausted, but where this condition of things is absent, it is best to leave the patient in the position occupied during the process of delivery. After the lapse of a longer or shorter period of time, the patient is more or less troubled with spasmodic contractions of the uterus, usually termed "after-pains." These are more common with women who have had a number of children than in cases of primiparæ, and they are often sympathetically excited by an application of the child to the breast of the mother. The collection of the coagula within the uterus or the uterine blood-vessels, is by some supposed to be the cause of these intermittent paroxysms of pain; but do we not see in this an effort of nature not only to expel the coagula above alluded to, but to bring on such a contraction of the organ as will reduce it to its normal size, and render the occurrence of hemorrhage almost impossible? We cannot agree then with Dewees, in thinking the existence of after-pains in a moderate degree, "an evil of great magnitude." They are certainly painful and annoying, but at the same time they are useful, and should not be interfered with, except when they become excessive, preventing sleep and producing considerable febrile excitement. The remedy in these cases, consists in the use of camphor and opium, either in pill or in solution. The following is an excellent formula, which Dewees was in the habit of prescribing:

R.—Gum. camphor. ℥i.

Sp. vini rect. q. s. f. pulv.

Adde pulv. g. arabic. ℥ij.

Sacch. albi. ℥ij.

Aquæ fluvial. ℥vj.

M. Sig. A tablespoonful to be given every hour or two, or oftener if necessary. Laudanum may be added if required.

Another variety of after-pain has been mentioned by Dewees as occurring immediately after the delivery. The pain is excruciating in character, and is seated in the extremity of the coccyx and sacrum, and does not usually intermit like the ordinary after-pains. This species of pain may also be relieved by the free use of camphor.

The Lochia.—This is a discharge which takes place from the uterus some short time after delivery, and is dependent upon the exudation of a bloody serum, from the partially closed mouths of the uterine blood-vessels. This lochial flow diminishes as the tonic contraction of the uterus becomes effected, generally lasting until the fifth day, or it may continue to a much later period.

Under ordinary circumstances, the lochia need not be interfered with; but when they become excessive, producing debility, &c., it will be necessary to resort to those remedies which will check the discharge. In this case astringents will be found serviceable, at the same time that tonics may be used for the purpose of bracing the system against the draining effects of so injurious a discharge. In other cases, they may be deficient in quantity, giving rise to febrile symptoms; here the treatment will consist in laxatives, sudorifics, &c.

Regimen during the Puerperal Month.—No subject can be more important than the proper knowledge of the treatment of a female after delivery. As a general rule (but one little observed, especially by the lower classes) the patient should be confined to the bed until the ninth or tenth day after the birth of the child. During this period, she may be allowed to sit up in bed or in a chair for a short time while the bed is being fixed. The diet, in ordinary cases, should for the first five days consist of sago, rice, gruel, arrow-root, panada, mush and milk, &c. At the same time she may take as a drink, tea, cocoa, toast and water, &c. After the fifth day, if the patient be doing well, she may be allowed a few oysters, or weak vegetable or animal soup, &c. After the tenth day the same diet may be used with the additional use of beef-steak, mutton-chop, birds, &c. If the patient be weak, a little porter may be given. From this period to the end of the month, the diet must be light, nourishing, and unstimulating.

During the puerperal month, there will be but little necessity for the use of medicines, unless some of the diseases incident to parturition should attack the female. The state of the bladder should be attended to, and if the bowels are not evacuated naturally by the third or fourth day, a dose of castor oil may be given.

Duties necessary to the child.—1st. Of washing the child. The surface of the skin, at birth, is covered over with a thick layer of sebaceous matter, to remove which requires some care. The best plan is to anoint the child well with fresh lard or butter, and then by means of warm soap-suds, the skin of the child may be rendered perfectly clean. When the substance, just alluded to, is not well removed from the skin, it will give rise to cutaneous excoriations of a troublesome and painful character. No other application to the body of the child is necessary but that of warm soap and water.

2d. When the child has been properly washed, the dressing of the navel will be necessary. The only necessity in doing this, is to prevent the dead navel-string from coming in contact with the surface of the child. Take a piece of linen, about six inches long, and through a hole made in its centre, let the cord be passed. After this has been done, the cord may be entirely enveloped by a small bandage, and the whole laid upon the upper portion of the pierced rag, over which the lower portion of this rag may now be placed. The cord is now placed so that its cut extremity looks towards the breast of the child. A belly band must now be put on, and the remainder of the dressing may be conducted according to the wishes of the parent, &c.

3d. The secretions from the mucous membrane of the intestines of the fœtus collect in considerable quantities, during the time of utero-gestation, so that at birth it becomes necessary to give some little laxative, for the purpose of purging it off. To effect this, the child should be early applied to the breast, as the milk at this time possesses some laxative properties. If this does not succeed, two or three teaspoonsful of molasses and water will usually suffice, or if this fail, a small dose of castor oil may be given, which, if it does not operate, may be followed by a warm injection. Where the *meconium* is retained, it will occasion considerable colic;

hence the necessity of purging it off soon ; but at the same time, the practitioner must be cautioned against the use of acrid substances for this purpose.

4th. Retention of urine or of the meconium, may depend upon physical obstruction, and this case will call for proper surgical interference. The urine may, however, be retained, when no such cause exists, and some medical treatment will be required. In this case, the use of small doses of the sweet spirits of nitre, accompanied with warm bathing, will usually suffice.

5th. The diet of the child should consist of the mother's milk ; but where this is deficient in quantity, its substitute may be found in fresh cow's milk, diluted with one third water, and containing a small quantity of loaf sugar. Nature has endowed the newly born child with a very small stomach, for at this time, the large extremity is but little developed, hence the importance of guarding mothers and nurses against giving too much food at once ; but requiring the child to be fed frequently, (say every two or three hours,) with a small amount at each time. If too much food be forced into the stomach, one of two things takes place,—either it is vomited up, which is a most favourable circumstance, or it is retained, and disorder of the stomach and bowels is the result. As the child grows older, the character of its food may be changed, but these dietetic rules belong more properly to a work upon the management of children.

CHAPTER XI.

SECTION I. *Presentations of the Face.*—These have been considered by most accoucheurs as deviations from the vertex, which, when the uterine contractions have commenced, is forced not into the inlet of the pelvis, but against some part of its circumference, giving rise to such an extension of the neck as to throw the face into the superior strait. The cause of this deviation from the vertex presentations, has been attributed to an obliquity of the uterus; but Dubois disproves this assertion, by remarking that in eighty-five face presentations, there were only three cases which were accompanied by uterine obliquities of any consequence. It is farther shown from the observations of Mesdames Boivin and Lachapelle, that the fœtus does present with its face previous to the commencement of labour.

The labour in face presentations will doubtless be tedious, and in some cases, artificial aid may be required, but the practitioner should ever bear in mind that they are to be regarded as natural; in other words, that their delivery may be effected by the efforts of nature alone. By the older writers, these face presentations were regarded as essentially preternatural, always requiring manual or instrumental assistance. The error of this opinion cannot be too forcibly impressed upon the mind of the practitioner. The face may be distinguished from the vertex and breech, by the softness of the cheeks, by the eyes, nose, chin, and mouth, and if the finger of the accoucheur be inserted into the latter, the gums will be felt, and the diagnosis rendered certain. In some cases, where the face has descended considerably, the ears may be distinguished, and a careful examination of their position will not only enable us to detect the presentation, but the position which the face has taken in regard to the pelvis.

In a report made by Dubois of all the cases which occurred at the Hôpital de la Maternité, from the year 1823 to the year 1831,

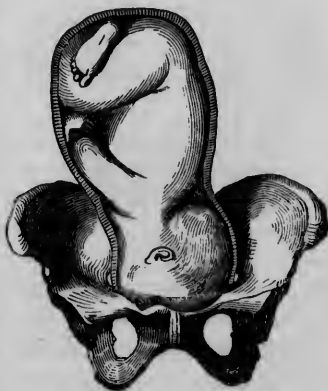
it appears that the face presented 85 times in 22,539 labours; that is to say, they occur *once* in every 272 cases.

The face presentations may be divided into four positions: 1st. The *right mento-iliac*, which is the most frequent of all; 2d. The *left mento-iliac*, the next in frequency; 3d. The *mento-pubic*; 4th. The *mento-sacral*. The third and fourth positions are very rare; neither Dewees nor Moreau have ever met with such cases, and it is supposed that those reported by Smellie and Delamotte, occurred in children which were exceedingly small, or had not as yet reached the full term of development.

Before describing the mechanism of these face presentations, we may add, that some writers on obstetrics have admitted the several oblique positions of the face at the superior strait, but as the transverse positions are the most frequent, they may be regarded as the primitive positions from which the oblique positions may be derived during the process of labour. In this opinion we are supported by Mad. Lachapelle, who asserts that the transverse positions are of most frequent occurrence.

1st. *The right mento-iliac position.*—The chin is to the right side in this position, and the forehead to the left. Before the extension of the neck has been so forced as to throw the occiput back upon the body of the child, the mento-bregmatic diameter will correspond to the transverse or long diameter of the superior strait—the bi-temporal with the antero-posterior of the same strait, while the mento-bregmatic circumference will offer to that of the pelvic brim. The back of the child points to the left side of the mother, the abdomen to the right side, the left shoulder posteriorly, and the right anteriorly. This position of the body is not a matter of indifference, for it will enable us to ascertain in what part of the uterus the feet are placed, a

Fig. 17.

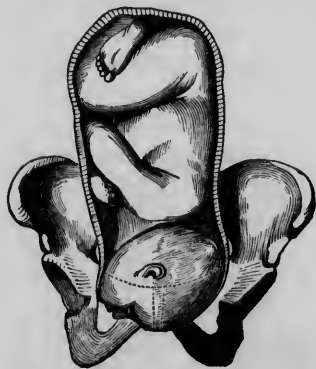


matter of great importance when turning may become necessary. (See fig. 17.)

The diagnosis in face presentations is very difficult, where the face is elevated or where the membranes are unruptured and tense; but if the os uteri be dilated, and the membranes flaccid or ruptured, and if the face has descended low in the pelvis, the diagnosis becomes very easy. If the extension be not as yet very great, the forehead will be felt traversed by the coronal sutures. The orbital processes, the eyes, the nose, the mouth, and the chin, and sometimes the ears, may be successively discovered by a careful exploration with the finger. Where the labour has continued for some time, the parts become much swollen, and great care will be required to detect the various points of diagnosis to which we have alluded.

Soon after the rupture of the bag of waters, the expulsion commences, the mechanical phenomena of which are executed in the following order. The uterine contractions becoming more violent,

Fig. 18.



force the face downward into the pelvis, and the extension of the head becomes much increased. When this extension has been perfected, and the face has fairly entered the brim, the relation of the parts are as follows: the fronto-mental diameter corresponds to the transverse diameter of the upper strait; the bi-temporal to the antero-posterior of the same, while the mento-frontal circumference offers to that of the pelvic brim. The position of the body of the child is not at all changed. The axis of the pelvis

will now traverse a line drawn from the posterior fontanelle to the superior lip of the fœtus. (See fig. 18.)

When extension has been accomplished, the face descends into the cavity of the pelvis, to the extent permitted by the length of

the neck of the child. It is evident it can go no further, for if it did, the head and a portion of the breast of the child would be contained within the pelvis at the same time—a thing impossible under ordinary circumstances. But if its descent is limited by the length of the neck, the face cannot descend, as the vertex does, to the floor of the pelvis, because the length of the neck of the child does not reach three inches, which is the depth of the lateral part of the pelvis. The face, then, in its descent, must stop at some point short of the pelvic floor, when its rotation commences. This rotation usually brings the chin under the symphysis pubis, and this is a point of great importance, for if the chin is not turned in this position, the difficulties of the delivery will be immense, since it will cause the longest diameters of the foetal head to correspond with the long diameter of the inferior strait.

It is this failure to rotate the chin towards the symphysis pubis, that renders the posterior or lateral positions of the chin so difficult, and forms the most important peculiarity in the mechanisms of the different face positions. All these positions would be nearly equally favourable, were it not for this circumstance. A glance at the two figures will indicate our meaning. In figure 19, the chin has made its appearance from under the symphysis pubis, while the body of the inferior maxillary bone is applied to its posterior face, so that when arrived at this point, the head becomes flexed, and the face, forehead, and vertex are delivered, (as is shown in the linear representation in Fig. 19,) without bringing the long occipito-mental diameter of the foetal head into correspondence with the antero-posterior diameter of the pelvic cavity or of the inferior strait. It is easily understood, that where the chin fails to be rotated under the symphysis pubis, the mechanism will be, if the head is full size, impossible, because the occipito-mental diameter of the head must

Fig. 19.



at some period of the process, offer to the antero-posterior diameter of the inferior strait of the pelvis. It may be laid down as a positive rule, *that in all face presentations, the chin should rotate towards the symphysis pubis; that when the efforts of nature or artificial means, fail to accomplish this, the delivery, in a full-grown fœtus, will be rendered almost, if not utterly impossible.*

After the face has descended as far as the length of the neck of the child will permit, rotation occurs, by which the chin first makes its appearance under the symphysis pubis, while the body of the inferior maxillary bone, and finally the neck of the child, is applied to the posterior part of this symphysis. The body, in this case, has not yet entered the pelvic excavation. (See Fig. 19, above.)

The movement of descent and rotation having been completed, the flexion of the head commences. At this time the position will be found as follows: the chin has passed the arch of the pubis, and the neck of the child is now placed against the posterior face of the symphysis pubis, while the forehead and occiput occupy the hollow of the sacrum. But any farther descent of the neck being impossible, the force of the pains is now thrown upon the posterior part of the head, and gradually the præ-trachelo-bregmatic and the præ-trachelo-occipital diameters traverse the antero-posterior diameter of the inferior strait, and the whole head is expelled.

When the head has been delivered, the exterior rotation, carries the face round to the right thigh of the mother, and the shoulders enter the superior strait either in the transverse or the antero-posterior direction. The right shoulder emerges from under the symphysis pubis, while the left, traversing the hollow of the sacrum, is first delivered as in ordinary vertex cases. The delivery of the body of the child is effected in the usual way.

2d. *The left mento-iliac position.* The mechanism in this case is precisely similar to the one just described. Let it be remembered that the difficulties in face presentations will depend upon the position which the chin will assume after rotation has been accomplished, and that where the head and pelvis are of the ordinary size, the labour cannot terminate spontaneously, unless the chin be brought under the symphysis pubis.

3d. *The mento-pubic*, and the mento-sacral positions, are very

rare, and their spontaneous terminations are almost impossible where the head and pelvis are of the ordinary size. Dewees says, that where they do occur, it will be best to resort to turning, provided, 1st, the uterus be sufficiently dilated; 2d, the waters recently discharged; 3d, the head movable at the superior strait. If these conditions do not exist, we must endeavour to convert these positions into the transverse. This may be done by pressing the chin to one side with the finger, or by elevating the face with the hand and placing it in the transverse direction. Where these efforts fail to reduce the head, the delivery with the forceps must be resorted to, and if this is unsuccessful, perforation will become absolutely necessary.

If the first and second position of the face cannot be delivered spontaneously, what course must be pursued? The management of these cases will depend upon the progress of the labour and the condition of the soft parts. The following rules, extracted from the valuable work of Dr. Dewees, will serve to guide us in these cases:

“In the first and second presentations, we must have the concurrence of the following circumstances, before we attempt the reduction of the head: first, the uterus must be sufficiently open to permit the hand to pass, with little or no difficulty; second, the head must not have entirely passed the superior strait; third, the waters must have been recently expended. If these advantages combine, after having the woman properly placed, a hand must be passed into the uterus; and the choice of the hand is a matter of the first consequence to the success of the operation: the governing rule is simple, and easily remembered; namely, the hand which is to the side on which the vertex and forehead are placed; that is, in the first, the right hand must be used; because, when before the patient, the right hand offers to the left side of her, or the pelvis; if the second be the presentation, the left hand must be employed, for a like reason.

“In the first presentation of the face, we pass the right hand into the uterus in such a manner as shall put the back of the fingers to the posterior part of the pelvis, or before the left sacro-iliac symphysis, and place them on the side of the head, while

the thumb is pressed against the opposite side; the head is then to be firmly grasped, and raised to the entrance of the superior strait. When the head is thus poised, the extremities of the fingers are to be carried over the vertex, while the thumb is moved to the centre of the upper part of the forehead; the fingers are then made to draw the vertex downward, while the thumb tends by its pressure, to carry the face upward, thus executing a compound action upon the head. All this, it should be remembered, must be executed in the absence of pain; if we find, when pain comes on, that the vertex moves sufficiently downwards, and the face upwards, to give assurance it will now descend, we may withdraw the hand, and trust the rest to the action of the uterus. But if, on the contrary, upon the accession of the pain, we find the face still has a tendency downwards, we may be certain that the reduction is incomplete; and we must again and again attempt it, in the absence of pain, if it be necessary: for, under the circumstances I have stated, we are pretty sure of success under a well-directed management.

“In the second presentation, we employ the left hand, under the conditions I have stated for the first, and act in every respect as directed for that presentation.

“Should however the above-stated conditions of the uterus not be present at the proper time, or should the head have descended through, (or nearly through,) the superior strait, we cannot hope to succeed by any attempt made with the hand to reduce the vertex; the choice of remedy will then lie between turning, and the vectis. We should prefer turning, when the waters have not been too long drained off, when the pains are not either very frequent or severe, and while the head is still enveloped in the lower part of the uterus.

“The vectis may be tried under the contrary condition of things, by passing it up the side of the pelvis, until it pass over the vertex; when it is placed, we must endeavour to raise up the face with the other hand, and prevent the vertex rising at the same time, by a counteracting force exerted by the vectis; this should be performed in the absence of pain, and continued until the face is found to ascend, and the vertex descend. If these manœuvres

succeed in getting the vertex down, we may commit the rest to nature. It may, however, agreeably to my own experience, be practicable to turn, after the vectis has failed."

SECTION II. There are some irregular presentations of the head, which it will now be necessary to describe.

Presentations of the Side of the Head.—These are regarded as deviations from the vertex presentations, and may be distinguished by the presence of the ear. Each side of the head may present in three different ways. Baudelocque made four: but this fourth cannot occur, since there can be no posterior obliquity of the uterus. 1st. Where the lobe of the right ear points to the pubis, and the long diameter of the external ear lies in the direction of the antero-posterior diameter of the superior strait, the face looks to the right side of the pelvis, and the vertex to the left. In this case, the feet will be found to the right side of the uterus. This position is a deviation from either of the cases, where the occiput would have presented to the left side of the pelvis, and is due to an anterior obliquity of the uterus.

In this case, the patient should be placed upon her back; and the uterus, by means of a bandage, must be made to assume the proper direction. This plan of treatment will usually succeed in bringing the vertex down.

2d. When the lobe of the right ear presents to the right side. This position is due to a right lateral obliquity, and must be rectified upon the same principle to which we have just alluded.

3d. The lobe of the right ear points to the left side of the pelvis; and as this position is due to a left lateral obliquity, it will be best rectified by placing the female upon the right side.

The left side of the head may present an equal number of times. They are recognisable in the same manner as those of the right side; and being deviations from the right occipital positions, their occurrence is attributable to obliquities of the uterus, which must be rectified in the manner above described.

Brow Presentations.—The brow may present in four different ways at the superior strait, and in each case the difficulties in delivery are exceedingly great, and it is fortunate that they frequently become converted into either the vertex or face positions. Where

this does not take place spontaneously, it may be effected by artificial means, provided the malposition be detected at a sufficiently early period. If the anterior fontanelle present, it may be ascertained even before the rupture of the membranes, but the greatest care should be taken by the accoucheur not to rupture these before the os uteri is well dilated. As soon as this dilatation occurs, and the membranes are ruptured, the diagnosis must then, if possible, be made out.

1st. *Where the Face looks diagonally backward.*—In this case the sagittal suture is found to run forward and upward towards one or the other groin, while the coronal suture runs backward and upward; the forehead looks backward, while the bregma is placed anteriorly. If this position be detected at an early period of labour, before the forehead has entered the pelvic brim, we must endeavour to convert it into the vertex presentation, by pressing the fingers against the brow during the existence of a pain, so as to retain it in an elevated position, while the pains may effect the descent of the vertex. If we succeed in this, it will become a simple occipito-cotyloid position, requiring no further management. But the head may have entered the pelvic cavity in this way. The mode of operating here is more difficult, but must be effected as follows: “in this case it is essential to success that we raise the forehead during the *absence* of a pain, and particularly if the head have escaped the orifice of the uterus; when this is the case, it requires the introduction of the hand to raise the whole head; this should be done first, that we may be certain of keeping the forehead sufficiently high to permit the vertex to descend. After we have raised the head sufficiently towards the superior strait, we must place the extremities of the fingers against the posterior edge of the frontal bone, and make them serve as fulcra, as in the first instance. In doing this, we should carefully avoid pressure upon the anterior fontanelle. When the position is rectified, we must withdraw the hand and let nature perform the rest.”

2d. *When the Brow presents and the Face looks towards the front side of the pelvis.*—The same means of detecting this position will offer as in the preceding position. The mode of managing

this case is similar to that just described, but where the conversion is successful, the forehead will be placed behind the cotyloid cavity.

3d. *Where the Brow presents, the Face being turned toward either the Pubis or Sacrum.*—The same treatment will be required, and the conversion will result in an occipito-pubic or occipito-sacral position of the vertex.

In some cases, presentations of the brow become converted into those of the face.

We have not thought it necessary to enter more into the detail of these irregular positions of the vertex, since their rectification is spontaneous, and where it is not, the mode of effecting it is exceedingly simple after the malposition has been ascertained. In some cases, where neither spontaneous nor artificial rectification can be effected, and the delivery is rendered impossible, we must then successively try version, the vectis, the forceps, and possibly the perforator.

SECTION III. *Presentation of the Pelvic Extremity of the Fœtus.*—Under this head will be comprised, presentations of the breech, feet, and knees. This variety of presentation, is next in frequency to that of the vertex, thus, in 84,395 labours, the pelvic extremity presented 2,842 times, and out of this number there were of the breech 1,811, of the feet 1,010, of the knees, only 21 cases.

In these cases, nature is usually fully able to accomplish the delivery, though in some instances the intervention of art becomes necessary; hence it is that some authors have included pelvic presentations under the head of artificial labours. In 2000 cases of this kind, observed at the Hôpital de la Maternité, only 82 cases required assistance, viz., 57 out of 1214 where the breech presented; 25 out of 772 where the feet presented; while the 14 presentations of the knees terminated favourably without any assistance. Though the pelvic presentations have been retained in our arrangement under the head of natural labours, still it must be borne in mind that they are slow and tedious; distressing to the mother, and more dangerous to the child than the vertex or face cases. In 790 pelvic presentations which terminated without assistance, there were 101 deaths; 98 were of feeble constitution, and 16 were delivered prematurely. On the contrary, in 20,567

vertex cases, only 635 died, while in 88 face presentations, there were only 3 deaths.

Thus we see, that though the pelvic presentations may be delivered without assistance, yet the mortality is much greater, and the health of the child much more enfeebled, than in presentations of the vertex. What is the cause of this? 1st. The labour is always more tedious, and this is occasioned by the size of the presenting part, and the little firmness it offers to the mouth of the uterus during its dilatation. 2d. During the delivery of the head, which is nearly always tardily effected, the cord is almost necessarily compressed. 3d. According to Moreau, the pressure exercised by the os uteri, &c., on the body of the child, tends to press the blood upwards to the head, by which congestion of that organ is produced.

No satisfactory reason has as yet been given in explanation, for the occurrence of breech presentations.

Diagnosis.—Before labour has commenced, we may call to our aid, in the diagnosis of these pelvic presentations, some of the following signs: thus, in those females, whose abdominal parietes are thin and easily depressed, the head of the fœtus may be felt in the upper part of the uterus; and if an exploration be made per vaginam, the difficulty experienced in reaching the presenting part, will render the diagnosis approximative at least. If, in this case, auscultation be resorted to, the pulsation of the fœtal heart will be heard in the upper part of the abdomen.

When labour has begun, an elongated protrusion of the bag of waters through the os uteri into the vagina, is usually indicative of the pelvic presentations, or of any presentation which does not easily enter the pelvic cavity. This sign is not, however, to be implicitly relied upon; for in one case, we have discovered this elongation of the bag of waters as low down as the os externum, and though no presenting part could be touched, yet the head soon made its appearance within the pelvic excavation. When the membranes rupture, the discharge of water is usually more profuse than where the lower part of the uterus is accurately closed by the presenting part, as in vertex cases. The discharge of the meconium, at this time, has been considered as an evidence of pelvic

presentations; but, in this matter, the obstetrician should not be misled, for though the appearance of the meconium, in some cases, indicates the presentation of the pelvis, yet it frequently occurs as a sign of the death of the fœtus, without any regard to the presentation.

The signs furnished by touching the presenting part with the finger, are the only ones upon which implicit reliance can be placed. When the finger is introduced through the os uteri, a round soft tumour is felt, at the circumference of which may be felt the hard trochanters. If the finger be carried still farther, the fissure separating the two thighs will be discovered; along this fissure, the point of the coccyx, the anus, and the organs of generation may be successively diagnosticated. The discovery of the point of the coccyx not only serves as a diagnostic sign of the presentation, but also of the position of the presenting part.

When the feet present, it is not difficult to distinguish them from every other part of the body; and the direction which the os calcis assumes, will indicate the position which the pelvis will take when it descends into the pelvic cavity. The difficulties in our diagnosis are much increased, when only one foot presents, or when both present along with the breech; in these cases, a careful analysis of all the points of the presenting part will generally serve to establish the diagnosis.

The knees present, as we have seen, very rarely, and are recognised by their form, hardness, &c. Above each presenting knee, the finger may, when sufficiently elevated, detect the space existing between the upper part of the leg and the lower part of the thigh.

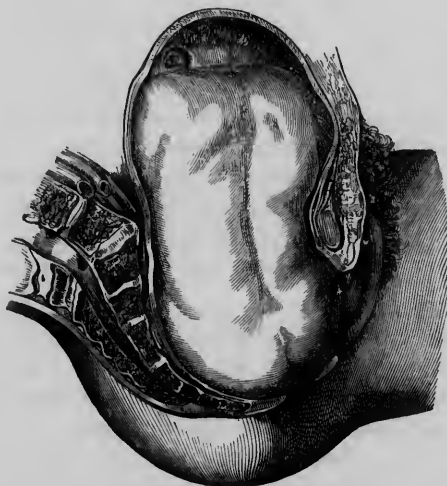
In breech presentations, the sacrum is to be taken as the point designating the position of the fœtus, as it regards the pelvic strait; for the feet we have the os calcis, and for the knees the tibia.

The breech may present in four ways at the superior strait: 1st, *the right sacro-iliac position*; 2d, *the left sacro-iliac*; 3d, *the sacro-pubic*; 4th, *the sacro-sacral*. The two latter positions are exceedingly rare, and where they do occur, they frequently become converted into one of the others. In this classification, we do not pretend that the breech may not present in the oblique positions at the upper strait; but as the mechanism, on that account, is not

materially altered, a description of either variety which we have admitted, will convey a comprehension of the mode in which all the pelvic positions are delivered.

1st. *The Right Sacro-iliac Position.*—In this case, the sacrum is to the right side of the pelvis, and the bi-trochanteric diameter corresponds with the antero-posterior diameter of the superior strait. The back of the child is directed to the right side of the mother, and its face and abdomen to the left side. When the presenting part is driven down, by the force of the pains, the bi-trochanteric diameter still corresponds to the antero-posterior diameter of the pelvis (see fig. 20); *but* if the child be unusually large,

Fig. 20.



or the pelvis unusually small, the left trochanter will rotate towards the right sacro-iliac junction, and the right to the left cotyloid cavity. In some cases, this rotation may occur differently, so as to throw the right trochanter behind the right cotyloid cavity, &c. &c. Whether this rotation takes place or not, the pelvis is forced down to the bottom of the pelvic excavation, when the right hip takes its position behind the pubis, and gradually makes its appearance under the symphysis pubis, a position which it usually

maintains, until the posterior hip has by the force of the uterine contractions been made to traverse the posterior part of the pelvis. During the passage of the posterior hip over the hollow of the sacrum, the body of the child assumes a lateral incurvation (see fig. 21), the concavity of which offers towards the symphysis pubis.

Fig. 21.



As the pains continue, the posterior hip is made to traverse successively the sacrum, coccyx, and perineum, and it is finally delivered. When the delivery has been thus far accomplished, the lateral incurvation of the body of the *fœtus* ceases, and a reverse movement takes place, so as to facilitate the delivery of the right or anterior hip. When the pelvis has been delivered, the oblique position is usually assumed, and in some cases the bi-trochanteric diameter retains this position throughout delivery. After the pelvis has sufficiently emerged, the inferior extremities fall out, and the body of the child has entered the pelvic cavity. The arms of the child usually are placed along the sides of the thorax, and the shoulders begin to enter the inferior strait in an oblique direction, where they have partaken of the rotation of the breech to which we have alluded. The right shoulder is forced under the symphysis

pubis, when it becomes fixed until the left or posterior one, traversing the sacrum, coccyx, and perineum, is finally delivered.*

The hands of the child being usually applied closely to the thorax, is delivered along with the body; but in some cases they are thrown up along the side of the head, occasioning considerable difficulty in the subsequent delivery, and frequently requiring artificial aid. The mode of effecting this will be explained hereafter. At the time the shoulders have been disengaged, the head, usually well flexed upon the thorax, has entered the superior strait, the face looking towards the left posterior part of the pelvis, and the occiput towards the right cotyloid cavity.

This flexed position is retained until the head reaches the inferior strait, when the relation of its diameters with those of the pelvis will vary according to circumstances; thus, if the flexion be moderate, the occipito-frontal diameter will be parallel with the right oblique diameter of the inferior strait, and the bi-parietal with the left oblique, while the axis of the inferior strait will traverse very nearly the trachelo-bregmatic diameter of the child's head. Where the head is much flexed, the axis of this strait will pass through the occipito-mental, and the occipito-bregmatic will correspond with the oblique diameter of the pelvis, &c.

When the head has arrived at this point, rotation occurs, by which the face is thrown into the hollow of the sacrum and the occiput behind the symphysis pubis, so that the post-trachelo-bregmatic or frontal, is nearly in correspondence with the antero-posterior diameter of the inferior strait. The head is now nearly or entirely within the vagina, and all the efforts of the abdominal muscles are required for its farther expulsion; but as the neck is fixed so firmly against the pubis as to prevent the descent of the occiput, the force of these pains falls upon that part of the head lying at the posterior part of the pelvis, so that the chin, face, fore-

* Dubois asserts that the anterior trochanter, in deliveries of the pelvis, and the anterior shoulder, in deliveries of the body, are entirely delivered before the part placed at the posterior part of the pelvis. This certainly is true in some instances, but cannot be laid down as the general rule, since the delivery, in a majority of cases, takes place in the way already described.

head, and occiput are seen successively emerging over the posterior commissure of the perineum.

2d. *The Left Sacro-iliac Position.*—The mechanism in this case is precisely similar to that just described.

3d. The sacro-pubic position presents some difficulty, which is usually overcome by the natural efforts, and the pelvis either enters the superior strait in the antero-posterior direction, or is turned to the oblique position. The head assumes a diagonal position, and no difficulty presents in its delivery.

4th. The sacro-sacral position is the most unfavourable, not on account of the delivery of the breech, for this may be effected in some way, as in the sacro-pubic presentation, but because the face of the child is placed in the anterior part of the pelvis. When this occurs, we should, by early and efficient, though gentle action upon the body of the child, gradually turn the child, so as to throw the face towards the posterior part of the pelvis. In some of these unfavourable positions, the natural efforts may be sufficient to rotate the head so as to throw the face towards the hollow of the sacrum. This favourable change may occur either before or after the delivery of the body of the child.

When, however, this rotation cannot be accomplished, and the face still remains in front, the delivery will be accomplished in one of two ways: 1st, the head will be forced into the pelvis in a state of flexion, and the forehead will be applied to the posterior part of the symphysis pubis, while the neck of the child is forced back against the posterior commissure of the perineum. The relation of the diameters of the fœtal head to those of the inferior strait will be easily understood. In this case, the chin and face will be first delivered, then the forehead and occiput. 2d. If the head be not in a state of flexion, the chin may rest above the symphysis pubis, and the anterior part of the neck of the child being applied closely to the posterior face of the pubis, the occiput will be made to traverse the whole posterior part of the pelvis, the perineum, &c., until its delivery is effected, which is soon followed by the passage of the face. In this case, excessive extension of the head will occur, and the delivery will be facilitated by gradually raising the body towards the abdomen of the mother. Where the face is delivered

first, the body should be thrown back against the posterior commissure of the perineum.

Presentations of the Feet.—Before the rupture of the membranes, the feet may be confounded with the hands, but after these have been ruptured, a close examination of the presenting point will render the diagnosis certain. They may present in four different ways; the mechanism of each is precisely similar to that of the breech presentations. The same may be said in regard to presentations of the knees. The prognosis of these presentations is not quite so favourable to the mother as vertex cases; the labours are usually tedious and distressing to the female. Breech cases are considered more favourable than where the feet present. The dangers to the foetus in the presentations of its pelvic extremity are very great. The causes of this have already been alluded to.

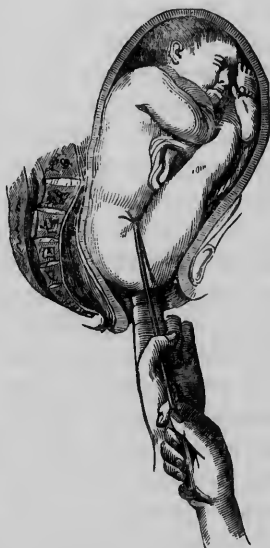
In presentations of the pelvic extremity of the foetus, no interference must be attempted unless imperatively called for; hence the accoucheur must be cautioned against pulling down the feet, or using any traction whatever calculated to hasten the delivery.

When the abdomen of the child looks anteriorly, we must, as has been already mentioned, endeavour to rotate the body, so as to bring the face towards the posterior part of the pelvis. This can be best done after the breech has emerged from the vulva, by rotating the body in the most gradual manner. Where the breech is large or the pelvis narrow, the delivery may be rendered so difficult as to require interposition on the part of the accoucheur—or some accident, as convulsion, or hemorrhage, may occur, demanding immediate delivery. In all of these cases, the physician must be cautioned against unnecessary interference, but where it is deemed necessary, the nature of the assistance will be determined by the degree of advance which the presenting part has made. 1st. If the reason for interference occur at the commencement of labour, when the presenting part is above the superior strait, our course will be governed by the condition of the uterus. If it be dilated or dilatable, whether the membranes be ruptured or not, the hand may be introduced for the purpose of bringing down the feet, and finishing the labour as directed when

version is resorted to. But should the mouth of the uterus be closed and undilatable, nothing should induce us to introduce the hand into the uterus in order to bring down the feet. The management in this case should be palliative and temporising. 2d. If delivery should be called for when the breech has descended into the pelvic excavation, though still retained within the uterus, our plan of treatment will depend, as in the above case, upon the condition of the os uteri. 3d. When reason for interference exists, after the breech has been expelled from the uterus, no attempt must be made to bring down the feet, unless the breech be small or the pelvis large, and unless the pains have ceased to be efficient. The delivery in this case will be best effected by acting either with the fingers, or the fillet, or the blunt hook. Where the breech is very low in the pelvis, the fingers may be passed above one or both groins, for the purpose of drawing down during the presence of the pains, and in the direction of the axis of the pelvis. If we are not able to extract the breech in this way, the fillet may be employed. By the employment of the fillet, (the application of which is represented in fig. 22), is meant the application of a piece of riband, an inch or two wide, around the groin of the child. This riband may be applied by pushing it before the finger until it can be drawn down on the opposite side, when traction should be commenced. These tractive efforts should be made during the presence of a pain, and always in a line with the axis of the pelvis.

If the application of the fillet is impossible, the blunt hook must be resorted to, and this may be applied by passing the instrument

Fig. 22.



up along the fingers until the groin is reached, when the hook should be turned so as to embrace the part upon which it is to act.

When the labour has been tedious, and where symptoms of exhaustion, or of inflammation arise, or where the pulsation of the funis is becoming feeble, there will be good reason for interference, provided it can be done without risk to the mother. In bringing down the feet, a great deal will depend upon the choice of the hand, and the rule in regard to this matter is this: let the hand be employed, the palm of which will offer to the anterior face of the body of the child. In some cases the abdomen of the child is so much distended either with gas or water as to protract the delivery. When this occurs, provided dangerous symptoms arise, the abdomen may be punctured so as to lessen its size and allow its expulsion.

In breech presentations, the delivery of the head is frequently attended with great difficulties, but of these we will speak more particularly in our chapter on turning.

SECTION IV. *Presentations of the Body of the Child.*—In accordance with the views of Mad. Lachapelle, we will only admit two varieties of body presentations, viz., one of the right lateral half, another of the left lateral half. Each one of these will be described under the head of shoulder presentations, for we agree with Moreau, in thinking that if any other parts of the sides of the foetal body should offer at the superior strait, before the commencement of labour, they will, by the force of the uterine contractions, become converted into presentations of the shoulder. Two positions of each shoulder will be made, and in designating these, the head of the foetus and the ilium of the mother, will be taken as points of departure; thus, for the right shoulder there will be two positions: 1st, *the right cephalo-iliac*, in which, the right shoulder presenting, the head will look towards the right side of the mother, the feet to the left, the anterior face of the child to the abdomen of the mother, &c. &c.; 2d, *the left cephalo-iliac*, where the head is to the left side, the back of the foetus to the abdomen of the mother, &c. For the left shoulder, there are also two positions: 1st, *the right cephalo-iliac*; 2d, *the left cephalo-iliac*.

Presentations of the shoulder occur about once in 250 cases, and the right shoulder, according to Mad. Lachapelle, presents

more frequently than the left. In addition to this, it is also stated that the back of the fœtus is most frequently turned towards the abdomen of the mother.

Diagnosis.—Presentations of the shoulder may be suspected by the following signs: the abdominal tumour is larger transversely than vertically, and if the walls be thin and flaccid, the head of the fœtus may be detected in one or the other iliac regions, while the other extremity of the foetal ovoid, the breech, will be found upon the opposite side. If a vaginal examination be made, it will be almost impossible, previous to the dilatation of the os uteri and the rupture of the membranes, to reach the presenting part, unless perchance the hand or elbow should offer at the mouth of the womb. The slowness with which the os uteri dilates, and the cylindrical shape of the bag of waters, will serve to elucidate the diagnosis. After the membranes are ruptured, and the os uteri well dilated, the diagnosis will be rendered more certain, and the presentation of the shoulder, or elbow, or hand, may now be ascertained. The diagnostic points of each of these parts must now be pointed out: 1st, where the shoulder presents, the finger, when introduced into the os uteri, will come in contact with a round tumour, smaller than the vertex or breech, upon the most prominent point of which the acromial process may be felt. The prominent ridge offered by the clavicle in front, and the spine of the scapula behind, (i. e. if the back of the child looks towards the back of the mother; if it should be placed differently, the clavicle will be felt on the posterior face of the presenting tumour, and the spine of the scapula on its front,) may be detected. Below the clavicle, the existence of the intercostal spaces will be observed, but the surface inferior to the spine of the scapula will be smooth, terminating below in the inferior angle of the scapula. With proper care, the finger may be carried into the axillary space.

But how are we to determine whether the right or left shoulder presents? What is the position which this presenting part has assumed? This may be done as follows: if the axillary space looks towards the left ilium, we may be sure that the head of the child is turned in the opposite direction, or to the left side; but farther, if in addition to this we find that the clavicle, bounded inferiorly by

the intercostal spaces, is placed anteriorly, the least reflection will convince us that it is the right shoulder which presents in its first position. The same means must be resorted to for ascertaining the other positions.

2d. If the elbow present, it will be recognisable by the presence of the olecranon and the two condyles, and by the flexion of the forearm upon the arm. To ascertain which elbow presents, and its position, it will only be necessary to remember that the concavity of the elbow always points in the direction of the inferior extremity of the fœtus, and that the forearm usually rests upon the anterior surface of the child's body; thus, knowing the direction of the head of the fœtus, and the position in which its body is placed, we of course know what elbow presents, and what position it has assumed.

3d. Where the hand protrudes into the vagina, the diagnosis of the position will be still more easily ascertained: for if the arm be placed in demi-supination, the thumb of the hand will point towards the head; the little finger towards the breech; the palm of the hand towards the anterior face of the fœtal body, and the back of the hand to its posterior face.

When the shoulder presents at the superior strait of the pelvis, the intervention of art is almost always required, though in some rare cases, especially where the fœtus is small, and the pelvis large, the natural efforts are sufficient for the purpose of accomplishing the delivery. In this case, the delivery may be effected in two ways: 1st, the shoulder, by the force of the uterine contractions, is forced out of the pelvic brim, so as to give place to the head or breech, which is delivered in the ordinary manner; 2d, the shoulder may retain its position within the brim, while the breech, by a forced flexion of the body, is forced into the pelvic excavation, traverses the whole posterior part of the pelvis, and is delivered. The first mode is termed "spontaneous version;" the second, "spontaneous evolution." But are we justifiable in waiting for this spontaneous version or evolution? To this question we answer, unhesitatingly, no. Spontaneous evolution takes place rarely, and ought not to be relied upon, unless the fœtus be under size, since every moment deferred, after the waters are discharged, renders

our subsequent interference much more difficult. As soon, then, (where the foetus has arrived at full term,) as the os uteri is dilated, or even dilatable, the membranes should be ruptured, and the operation for turning should be executed.

The presence of the hand in the vagina offers no embarrassment to the operation of version, but, on the contrary, enables us more accurately to determine the exact position at the superior strait; hence no effort need be made to replace it within the uterus.

The rules for turning will be given hereafter, when the general rule which should guide us in the choice of the hand, in the different positions, will be clearly laid down.

If the umbilicus, or in fact any other part of the child's body (as is admitted by some authors), should present, the same means of treatment must be resorted to, as in shoulder presentations.

In the above arrangement, we have made no classification of labours, but have preferred classifying the different presentations into *those* which require little or no assistance in delivery, as the vertex, face, and breech presentations, and *those* which require assistance, as in cases of shoulder presentations, since each one of these presentations may be accompanied by any one of the accidents, to be mentioned hereafter, as complicating labours, we have thought it unnecessary to specify labours as lingering, flooding, instrumental, &c.

CHAPTER XII.

Causes which Complicate Labour.—When speaking of the different presentations of the full-grown fœtus, we said that, as a general rule, those of the vertex, face, and breech, were to be regarded as natural; or, in other words, that the delivery in those cases might be accomplished without any material interference on the part of the accoucheur. Certain accidents, occurring during the progress of any position, whether favourable or unfavourable, might so complicate the labour, as to render interference, in some form or other, absolutely necessary. We now propose to treat of the nature of these accidents, and of the mode of management requisite in each particular case.

The accidents of labour may be divided into those referrible to the mother, or to the child. Of the first class of accidents, we will mention: 1st. *Rigidity of the soft parts.* In this case, the rigidity may be confined either to the os uteri, or the vagina, or the perineum. Most usually, all these parts are affected simultaneously.

This rigidity may occur in any case, but is most common in primiparæ, where the soft parts are contracted, and have never as yet been subjected to the excessive distension, necessary to allow the passage of a full-grown fœtus. This indisposition is still more marked in those who never have borne children till late in life. Plethoric females seem more subject to this rigidity than others.

We are led to suspect the existence of rigidity of the soft parts, *where*, though the head offer favourably, though the pelvis be of a natural size, the part ceases to advance through the excavation. On examination, the parts will be found hot, and dry and swollen, and tender to the touch; the patient becomes feverish and restless; the pulse rises; and finally, upon the continuance of the above

symptoms, the exhaustion of the vital forces begin to show themselves.

If the pulse beat over one hundred, or one hundred and ten ; if the parts be swollen and tender ; if a sanguinolent discharge from the vagina makes its appearance ; if exhaustion begins ; *then* interference, on the part of the accoucheur, will become necessary.

The practitioner must beware, in these cases, of the use of stimulants, whether general or uterine ; for if the uterus be thus goaded to more frequent and more violent contraction, while the soft parts remain in a rigid condition, then laceration will become inevitable. No stimulants are required ; and the student should be specially cautioned against the use of ergot ; a remedy, under these circumstances, injurious to the well-being of both mother and child.

In order to produce relaxation of the soft parts, our greatest remedy consists in copious venesection. Bleeding *ad deliquium animi*, while the patient is in the erect position, will usually bring about a relaxation of the soft parts. That this assertion is true, is sufficiently proved by the fact that rigidity is rarely met with in flooding cases.

Warm baths have also been recommended, but these cannot be recommended, lest their use should be followed, as it often is, by dangerous flooding.

Warm fomentations have but little effect in reducing the rigidity of the soft parts ; still, they may be tried, for though not often beneficial, they rarely act injuriously.

Injections of tobacco have been advised, but the prostration consequent upon their employment, is so great as to render their use inadvisable and hurtful.

In laborious labours of this kind, if the course pursued be not successful, our only resource rests in the employment of the perforator, or possibly the forceps. Blundell says, if there are no dangerous symptoms ; if the woman have not been in labour twenty-four hours after the discharge of the waters, instruments are not justifiable ; but if the contrary exists, then the perforator may be used, the more especially since the child is dead in a majority of these cases. The forceps of course cannot be employed where the rigidity involves the os uteri, for it is a rule, never to

be deviated from, that these instruments should not be employed unless the os uteri be dilatable or sufficiently dilated.

While the presenting part is descending over the rigid perineum, the accoucheur should use his hand as a means of counterpressure, so directed, as to break the force of the bearing down pains. If this were not done, the force of the expulsive efforts might be sufficiently strong to rupture the perineum; but if, by means of counterpressure, we prevent the injurious effects of too violent expulsive efforts upon a rigid, but gradually dilating perineum, we perform a duty of great advantage to the mother.

As to the dilatation of the os uteri, it should never be interfered with manually, except under the following conditions, laid down by Dewees :

“1st. When this part does not coincide with the direction of the uterine forces, and the axis of the vagina. In this case, labour may become very tedious, for the want of a correspondence of axes; I therefore attempt to establish them, as directed in cases of obliquity of the uterus.

“But I never attempt even the slight change here spoken of, until the os uteri is yielding, and at the same time dilated, to the size of a dollar, and the pains in pretty full force. By this method, not the slightest violence is committed; nor is even pain excited.

“2d. When the pains are powerfully protrusive, and the os uteri, though pretty amply dilated, yet not sufficiently so to permit the parietal protuberances to pass freely through it. In this case, much time and suffering are very often saved, by running the extremity of the finger round the margin of the os uteri, and gently stretching it. For in many instances, if we gain an increase of half an inch in the diameter of this part, it is all that is required, to enable the head to pass it.

“3d. When the head is detained by the anterior portion of the uterus being in advance of it, and holding it, as it were, in a sling. In this case, that portion of the neck of the uterus, which is placed before the head, is obliged to sustain the whole force of the uterine efforts; in consequence of which it becomes not only

severely stretched, but it very effectually opposes the advancement of the presenting part, and gives rise to much unnecessary delay, as well as very much augmenting the sufferings of the patient.

“ This case is one of very frequent occurrence; and women who have ample pelves, and especially those who have had several children, and are liable to the anterior obliquity of the uterus, are more particularly obnoxious to it. I do not know that any writer has noticed this cause of tedious labour; and though this cannot, strictly speaking, be considered as an instance of rigidity, it nevertheless has all the effects of that condition, as it creates delay, by a portion of one of the soft parts opposing the passage of the head; and may, therefore, with much propriety, be considered under the present head of our subject.

“ We are every way satisfied from long observation, that this situation of the uterus, and of the head of the child, is one of the most common causes of delay when everything else is favourably disposed, that occurs in practice; at least in this country. Whether this be so in Europe, where the remote causes, namely, large pelves, are not so general, we are unprepared to say; but we are certain, that the frequency of this relation of the head of the child, and the anterior portion of the uterus in this country, renders such labours more tedious by hours, than they would be, if no such interposition of the neck of the uterus took place.

“ It is true, that the remora which the neck of the uterus offers to the passage of the head when down before it, never of itself creates a serious difficulty; the evil chiefly consists in a painful and an unnecessary delay; but as the case is always manageable, when it is proper to offer aid, it is certainly right to correct this deviation from a strictly healthy labour, as early as circumstances will permit.

“ The proper time to act is, when the head occupies the inferior strait and vagina, completely; when the pains are active; and when the os uteri is sufficiently dilated to permit the head to pass, if the axis of the head, and that of the os uteri, were coincident.

“ To relieve the head from this state of embarrassment, we must draw the prolapsed edge of the os uteri by the point of the finger in the absence of pain, towards the symphysis pubis, and

maintain it there, until a pain comes on. At this moment, the point of the finger is to be placed against the edge of the uterus, which is to be pushed upwards between the head of the child and the pubes. Should we be able to carry the prolapsed portion of the uterus above the advancing portion of the head, the former will suddenly withdraw itself from the finger; the vertex will apply itself to the arch of the pubes, and the labour terminate almost immediately.

“It sometimes, however, requires several trials of this kind before they may succeed: but the attempt must not be abandoned because it fail a few times, for the principle is a correct one, and should be acted upon perseveringly, should perseverance be necessary. We have everything to gain, if we succeed: and nothing to lose, if it fail; a disappointment, by the by, which cannot well happen, if the process for the restoration of the prolapsed part be properly conducted.

“We are convinced that we have seen very many labours, shortened by hours, by acting as just proposed for such cases. It would be extremely difficult to determine, *à priori*, the duration of a labour of this kind, if left to itself; as the resistance which the margin of the uterus offers to the head, will for a long time be more than equal to the power of the uterine forces; consequently, the labour becomes stationary, and will continue to be so, until the margin of the uterus is obliged to yield, by its losing a part of its power from attenuation, or perhaps by tearing.

“Nobody estimates the general rule, ‘to let a labour alone that is advancing well, and is natural in its general relations,’ more highly than we do; we look upon it as a most wholesome restraint when acted upon; and is every way calculated to diminish ignorant and mischievous officiousness. But this rule, like every other general rule, has its exceptions; and we may be even accused of violating it unnecessarily, when we make the cases under consideration exceptions; but we should feel but little concern upon this head, if the charge be even preferred against us, as we are certain that we are justified in making them, from an ample experience.

“Many, nay, perhaps everybody, (for we have said that we did not know that this case had been noticed,) will condemn what

we have said upon this subject, and consider our directions as unnecessary, if not mischievous, because they have never had recourse to them, but have permitted the uterus to perform this duty unaided; therefore they say nature is competent to the work, and when she is competent, she is not to be interfered with. Were this rule rigidly acted up to, there would be an end to improvement, not only in the obstetric art, but in the whole range of practical medicine. Our experience, however, teaches us not to heed this sweeping, indiscriminate rule; for it is not sound practice to permit nature to struggle through difficulties merely because it is supposed she can struggle through them; and to leave it for some time a moot point, whether or not the case will eventuate in safety, when aid, as certain, as safe, is always at command. Nor does this application of the finger ever produce pain or other inconvenience, if properly and gently managed.

“ Besides, much delay is sometimes experienced from this dropping down of the anterior portion of the uterus, by interrupting the pivot-like motion of the head, from completing itself; especially when the head occupies pretty strictly the inferior strait. In this case the posterior fontanelle will remain for a long time stationary behind one of the foramina ovalia; for its advancement towards the arch of the pubes is prevented by the prolapsed portion of the uterus interfering with the motion just mentioned, by embracing too strictly the advancing part of the head.

“ But the pivot-like motion of the head is almost always restored the instant we succeed in passing the depending portion of the uterus above the head of the child by the point of the finger, as directed above.”

2d. Partial contractions of the womb may occasion difficulty in labour cases. By these we mean an undue tension of the lower part of the uterus, caused by want of relaxation in the os uteri, &c. There are two varieties of this species of accident: 1st, the rigid contraction of the inferior edge of the os uteri around the neck of the child after the head has been delivered. This is a serious accident, as the shoulders, under these circumstances, can hardly be delivered. It is a very rare occurrence, so much so that Dewees and Baudelocque have never met with it in but one instance,

and Moreau, who has never seen it, seems to doubt its existence. This untimely contraction of the fibres of the os uteri, is due to the tendency which the uterus, after having been greatly distended, has to return to its normal condition; and whenever there is no advance in a labour, though the pains are severe, and no other cause can be discovered to impede the delivery, we may suspect its existence. By an examination, per vaginam, the lower edge of the os uteri is found closely contracted around the neck of the child. When this accident is found to exist, and when the powers of the uterus seem unable to overcome the constriction, bleeding *ad deliquium animi* must be resorted, and in a majority of cases it produces sufficient relaxation to allow the expulsion of the child. Should the pains, however, not prove sufficient to effect the delivery, the application of the forceps may be resorted. The use of the forceps in these cases, must always be preceded by copious venesection, since traction with these instruments would produce a rupture of the fibres of the os uteri, as long as their constriction continued. The next variety is that in which the head is found enclosed within the neck of the uterus. It must be remembered, that at the ninth month of pregnancy, the neck of the womb is entirely effaced, but when uterine contractions occur, and the uterus has been partially emptied by the discharge of the liquor amnii, the organ shows a strong disposition to return to its usual form, and thus the neck is found to enclose the fœtal head, which had previously advanced toward the dilated os uteri. The symptoms of this accident are similar to those present in the preceding case, except that the head is still within the uterus, and the upper circle of the cervix uteri surrounds the neck of the child. This accident frequently occurs where the waters have been long drained off, and where the expulsive pains have been feeble and ineffective. Dewees says, "he has rarely failed to find it where it has been expedient to finish a labour by turning, where tediousness and other causes have rendered this interference necessary"—and he adds, that it is one of the greatest obstacles in cases of cephalic version. The treatment in this case consists in very copious venesection, which, if it fails to produce relaxation of the constricted fibres, sufficient to

allow the delivery to take place by the efforts of nature, will at least put the parts in a proper state for the operation of turning, or if that cannot be done, for the application of the forceps, according to the rules to be laid down hereafter.

3d. The premature escape of the waters may occasion a tonic rigidity of the soft parts, which becomes a cause of tedious labour. These are treated by bleeding, &c.; and if these means do not succeed, we must either turn and deliver, or resort to the use of the forceps or perforator.

4th. The membranes may be so tough as not to break at the proper time. In this case, if the soft parts be dilated or dilatable, and the pains active, it will be best to rupture the membranes, since they have performed all the uses for which they were intended.

5th. Cicatrices from previous laceration, or from other causes, may retard labour. These cases must be treated by copious bleedings, and a reliance on the efforts of nature. Should these not succeed, it will become necessary to make such incisions as each particular case may require.

In all cases of rigidity, perforation of the head is usually preferable to either turning or the forceps, since the child is, in a majority of cases, dead, before these extreme means of treatment are determined upon.

6th. *Obliquities of the Uterus* may occasion difficulty in delivery, since in these cases the os uteri is thrown out of the line of the direction of the axis of the pelvic excavation. There are three varieties of obliquity, an anterior and two lateral. The deviation in each case must be corrected by the judicious use of bandages, and by forcing the patient to maintain a proper position.

7th. *Inertia of the Uterus* is another cause of tedious labour. Exhaustion, during parturition, may be due either to a loss of muscular strength, or to a want of contractile force in the uterus. These two forms of exhaustion may exist separately, or they may be present at the same time.

Loss of muscular strength does not necessarily imply that delivery will not take place; hence it does not become a positive source of impeded labour. Where it exists, it may be remedied

by a resort to the usual stimuli, where these are not contra-indicated in other respects.

Where the loss of contractile power in the uterus exists, it becomes a source of serious difficulty in the subsequent delivery, and will require the most decisive steps on the part of the accoucheur. The existence of inertia uteri may be simulated by over-distension of the organ, from excess of liquor amnii. This over-distension may be ascertained from the following symptoms: the pains return at uncertain periods, and are confined to the uterine globe, with very slight bearing-down pains. The bag of waters do not become tense during the continuance of the pain, nor does the uterus, when felt over the abdomen, harden as is usually the case. The patient becomes restless—labour does not advance, though the soft parts are relaxed and dilated. The pulse is quick and full, and the abdominal tumour unusually large. The remedy in this case, consists in the rupture of the membranes and the evacuation of the waters. No stimulants of a general or specific character, will do any good in these cases.

Or inertia uteri may be simulated by an engorgement of the uterus. In this case the labour commences favourably, but the pains gradually diminish both in frequency and intensity, and are felt over the whole abdomen. The os uteri seems disposed to dilate, but the presenting part does not protrude during a pain. The patient feels a sense of suffocation and sinking, though the pulse is hard and full. This case is to be relieved by venesection.

Again, labour commencing favourably, and continuing for some short time, may suddenly cease without any apparent cause, with præcordial oppression, palpitation of the heart, syncope, &c. In this case the os uteri may be dilated or dilatable. These cases must be remedied by those medicines which exercise a specific effect upon the contractile force of the uterus.

True inertia uteri exists, where, after long-continued exertion or hemorrhage, the pains cease, the patient becomes debilitated and disposed to sleep. The skin becomes cold and clammy; the countenance pale and haggard; pulse feeble and intermitting; nausea, vomiting, &c., are usually present. In some cases, however, this indisposition, which the uterus shows to contract, may occur inde-

pendent of long-continued exertion or hemorrhage, and it will then be accompanied by no other symptom than a cessation of the uterine contraction.

Where the inertia has been produced by long-continued uterine exertion, the cause of the obstruction should be removed, if possible, before an attempt is made by means of uterine stimulants, to rouse the organ to renewed contraction. Where a contracted pelvis is the cause of difficulty, of course the employment of uterine stimulants would be useless and highly injurious. Nor should these remedies be resorted to, where the soft parts remain undilated and rigid, since their laceration would be inevitable, if the uterus were stimulated to such contraction, as would be sufficient to effect the delivery. In these cases the rigidity should be removed if possible, and then the uterine pains may be excited by the different means in our power. If, however, notwithstanding our efforts to produce relaxation of the soft parts, these parts remain rigid and contracted, the best plan will be to perforate the head of the child.

Where the inertia results from hemorrhage, our treatment will be guided by the rules to be given hereafter, when treating of the management of flooding cases. If, however, the inertia should occur independent of the above cause, every means should be employed to excite uterine contraction. Frictions over the abdomen, the application of cold over the abdomen, the use of ergot, and the employment of any of the general stimulants, should all be persevered in, until the uterine contractions are restored. Within a few years, galvanism has been recommended by Dr. Radford as a powerful means of inducing uterine contractions. (See chapter on Hemorrhage.)

8th. *Syncope*.—Frequently labour pains are followed by faintings, which do not seem to interfere with uterine contractions. In some cases they are constitutional, while in others they are dependent upon uterine hemorrhage. Where they are not connected with any serious accident, such as flooding, they rarely require any special treatment; but when accompanied by flooding, whether concealed or not, they must be managed upon the principles to be laid down hereafter when treating of uterine hemorrhage.

9th. *Convulsions*.—In these cases the head is sympathetically

affected. Convulsions may occur at any stage of labour, and our treatment will be regulated, to a certain extent, by the condition of the soft parts and the advancement of the labour.

When convulsions occur, we must immediately resort to copious venesection, and if the soft parts be well dilated, we may turn and deliver as speedily as possible. If after the bleeding, the patient be not relieved, it may be advisable to rupture the membranes, for the purpose of reducing the distension of the uterus, even though the os uteri be not dilated.

Other remedies, besides general bleeding, must be employed: cupping, leeching, blisters, and cold applications to the head will all be found serviceable adjuvants in the management of cases of convulsions.

Where turning cannot be accomplished, though the os uteri be dilated, the application of the forceps may be resorted to. Of course, these instruments will be required, where the head has escaped from the os uteri; for it is an invariable rule in midwifery, that no effort should be made to turn after the head has emerged from the mouth of the womb.

10th. *Flooding*.—This is a frequent accident of labour in all its stages, and it is a subject of so much importance, that we shall treat more fully of its management hereafter; at present we will only state that our conduct in these cases will be governed by the following circumstances. If the os uteri is dilated or dilatable, we must proceed to turning, provided the flooding still continues unabated, notwithstanding the rupture of the membranes, and provided the life of the mother or child be in danger. If turning be impracticable, the forceps must be used. Dewees says, if the flooding commences long after the evacuation of the waters, and if it threaten the life of the mother, and if the child's head be at the superior strait, or near it, (but little pain being present,) we must proceed to turning. Davis and others recommend, under these circumstances, the use of the forceps. We entirely agree with Dewees in preferring the operation of turning to the use of the forceps, where the head is at or above the superior strait.

But if the os uteri be rigid and closed, nothing will justify us in entering the cavity of the uterus; and we must try to arrest the

bleeding, by placing the patient in the proper position, and by the use of all those means calculated to arrest the hemorrhage, (see chapter on Hemorrhage.) Where the os uteri is so rigid as to prevent our effecting delivery, by the operation of turning, or the use of the forceps, the hemorrhage may be partially arrested by a rupture of the membranes, and the evacuation of the waters, so as to allow the uterus to contract somewhat upon its contents.

11th. *Hernia*.—This sometimes complicates labour; and where it does, the most skilful treatment is required on the part of the accoucheur, in order to avoid the risk of strangulation, during the violent contractile efforts to which the female is exposed during parturition.

In deciding upon the treatment in these cases, we must be governed by circumstances. Where rupture exists, it will always be prudent, during the labour-pains, to protect the protrusion by the application of bandages, or perhaps by pressure with the hand. If, however, symptoms of strangulation should appear, the delivery should, if possible, be accelerated either by turning, or the forceps. If these means cannot be resorted to, we must moderate the protrusive pains as much as possible, and bleed, in order to produce the necessary relaxation of the parts. In other respects, the strangulated hernia must be treated upon the principles laid down in surgical works.

12th. *Hemorrhages from the Lungs, Stomach, &c.*, may at times complicate the delivery. In these cases, if absolute necessity requires it, after the ordinary means for arresting these hemorrhages have been tried, we must proceed to the operation of turning, or the application of the forceps, as the condition of things will best admit.

13th. *Deformities of the Pelvis* offer the most serious complications, in the process of parturition; and in many cases, the contraction is so extreme, as to require either the use of the forceps, or the perforator, or the induction of premature delivery, or the Cesarean operation. The extent and character of pelvic deformities, will be treated of more fully in a separate chapter, to which we would now refer the reader.

14th. *Rheumatism of the Uterus*, besides deranging the normal

progress of pregnancy, frequently complicates the parturient process. Though this subject had previously been treated of by medical men, yet the clearest account of its symptoms, &c., has been given by M. Cazeaux, in his excellent work upon Obstetrics. The translation of this article by Prof. Meigs, together with some additional remarks of his own, we take pleasure in inserting in this work.*

"Rheumatism of the womb," says M. Cazeaux, "after having long attracted the attention of the German practitioners, was but little known in France, when M. Dezeimeris, in his journal (*l'Expérience*), made public a series of facts already known and published by certain German authors. About the same time, M. Stolz, who had become acquainted with the labours of our neighbours on this subject, studied the affection at the Clinical Hospital at Strasburg, and communicated the results of his researches to his pupils. One of these gentlemen, Dr. Salathé, has very recently defended a thesis on this topic. To his work, and to the bibliographical researches of M. Dezeimeris, I am indebted for what I am about to say upon this disorder, which is hitherto unknown to our French nosologists.

"According to Radamel, rheumatism may attack the non-gravid womb; but our business here is to study it only as occurring in pregnant women. It may attack at any stage of gestation, and we shall, therefore, after some general considerations on the subject, point out the influence it may exert in pregnancy, in labour, and in the lying-in.

"*Causes.*—All such circumstances as are favourable to the development of rheumatic affections, may likewise lead to an attack of rheumatism of the womb. Thus exposure, whether momentary or prolonged, to dampness and cold, insufficient clothing, sudden transposition from an elevated to a very low temperature, and all other causes, constitutional and atmospheric, regarded by medical authors as occasional or predisposing causes of rheumatism, may also produce that of the uterus. But, besides these general causes, there is one peculiar to the malady under consideration. I allude to the facility with which this organ, under the thinned integuments

* The whole of this extract may be found in Dr. Meigs' translation of Colombat's work on Diseases of Females, page 286.

of the abdomen, feels the impression of cold in the latter months of pregnancy; the abdomen being guarded, where it incloses the uterus, by extremely light garments, which are closely in contact with it, and the antero-sacral region being often badly protected by jackets of insufficient length.

Symptoms.—Rheumatism of the womb often attacks persons constitutionally predisposed to nephritis. It may coexist with a general affection of the same nature; but, in a majority of cases, the uterus alone, and the adjacent structures, are the seats of disorder. It has, besides, been frequently found to be a consequence of the sudden cessation of rheumatic pain originally situated in some other part, and suddenly transposed to the womb. Whatever may be the mode of its onset, the disorder is easily recognised by very decided characteristic features. Its principal symptom is pain; where not the least violence has been offered to the organ, the womb becomes the seat of a general or partial pain, the intensity of which varies from the very slightest sense of weight up to the most insupportable agony. It may affect the uterus wholly, or only attack some particular part of it, as the orifice, the fundus, or the cervix. Where the rheumatism is fixed in the fundus only, the pain is felt in the region of the umbilicus. It is increased by pressure, by the contraction of the abdominal muscles, and sometimes by the mere weight of the clothes; the patient, often, is unable to move; if the disorder is seated lower down, there are shooting pains that run from the loins towards the pelvis, the thighs, the external genitals, and the sacral region, along the ligaments of the uterus. Lastly, when the cervix is the affected part, it may be known by the vaginal touch, which gives rise to excessive suffering. But of all the causes that serve to exasperate the pain, none is so distressing as the incessant motions of the child.

“Like other rheumatic pains, those of the womb are movable, and are observed occasionally to pass suddenly from one portion of the organ to another. They often suddenly cease, and proceed to attack some other organ. This is most apt to happen, when the uterine rheumatism has been preceded by a fixed pain in some

other part of the body, and where remedies are in use calculated to recall the pain to its original seat.

“These pains are characterized by frequent exacerbations, that are variable as to their duration and intensity ; according to the stage of the malady, they are succeeded by remissions, during which the patient only complains of a vague sense of weight.

“The pains of uterine rheumatism are generally attended with a degree of recto-vesical tenesmus, which is violent in proportion to the severity of the pains and the approximation of the seat of the rheumatism to the lower segment of the organ. In such cases, the patient is tormented by perpetual desire to urinate. The discharge of the urine is accompanied with smarting pain, sometimes with severe pains, and in some instances the discharge cannot be effected at all ; the efforts to discharge the contents of the rectum are, in some cases, equally fruitless. Most of the German authors attribute this double recto-vaginal tenesmus to the rheumatic disease, which is not always confined strictly to the uterus alone, but may likewise invade the circumjacent organs. M. Stolz seems disposed to think that it arises from the close sympathetic relations of parts so nearly approximated to each other. Should these new pains be owing to a vesical or rectal rheumatism, those of the womb would disappear, or, at least, be diminished in degree, according to the views of M. Salathé in his Thesis.

“It is to be supposed that there is a degree of heat and swelling of the affected parts ; but it is easy to perceive the difficulty of absolutely determining this point, one which we are compelled to admit from analogy.

“Pains of such violence, situated in an organ so important, must of necessity produce a pretty severe general reaction. The disorder, like most of the inflammatory diseases, generally commences with a slight rigor, which lasts fifteen or twenty minutes. The succeeding fever diminishes, or may even wholly cease, during the interval between the attacks, yet while they last it is commonly quite severe ; the pulse is hard and frequent, the face flushed and excited, the tongue red and dry, the thirst urgent ; the skin is hot, and the patient is often found to be extremely agitated and restless. Towards the close of the paroxysm, there frequently supervenes a

copious sweat, which seems to be the harbinger of a decided improvement. After this, these general symptoms are appeased, together with the uterine pains, only to reappear with them, after the lapse of a few hours, or even of several days.

“1st. *Influence of Rheumatism on the progress of Pregnancy.*—Where the attacks may have persisted for a length of time, or where they have been very violent, they are followed by uterine contractions, and may, in this way, bring on premature delivery. In such a case, the patient suffers from severe tensive pain. This feeling of tension is not equable, for it rises to a great height, and then subsides—to begin again and pursue the same course at different intervals. At first the womb becomes partially and afterwards universally hardened during the pain. The cervix becomes rigid and partially dilated, but its dilatation is at first slow and difficult, and its subsequent progress does not correspond with the pace of the pains. The abortion, with which she is now menaced, is more likely to take place in the febrile than in the apyretic form of rheumatism. Indeed, abortion is not so common an occurrence in the case as might be presumed. In some instances, the os uteri has been observed to dilate to the extent of two or three centimeters in diameter, the bag of waters has been formed, and afterwards withdrawn little by little, the orifice closing again, and all symptoms of labour wholly to disappear. As long as the diameter of the os uteri does not reach the extent of five centimeters, we may reasonably hope to put off the labour. These uterine rheumatic pains may simulate labour pains, and lead to the belief that they are really labour pains, while in fact they are not at all so. The characteristic signs of the rheumatic pains, given in the following paragraph, should serve to prevent such a mistake. It is surely to mistakes of this kind that we ought to refer those cases of supposed protracted pregnancy, and those instances of real labour, begun, and suspended again for weeks, and even for months together.”

“On the 21st January, 1842, Mrs. O., aged 28, in her first pregnancy eight and a half months, was suffering with the symptoms of severe rheumatism of the womb, which had afflicted her since about the 12th of the month. On the 15th of the month,

fearing that labour was begun, I examined, and found the os uteri dilated fully a quarter of an inch, and the cylindrical tubule of the cervix wholly gone: but on the 29th of the month, or fourteen days later, during all which time she suffered more or less, the os uteri was not only closed up, but the cylindrical tubule of the cervix was reproduced, and continued so until her child was born, on the 16th day of February.

“About three years since, a lady, a missionary, landed here from a voyage from Madras, of one hundred and twenty days. She walked a good deal on the day of her debarkation, and was seized with the signs of labour the same evening, being not quite eight months gone with child. The pains were strong; I found the os uteri an inch and a half in diameter, with the membranes tensely drawn across the opening. The labour was suspended in the night, but returned again the next afternoon; and during twenty-four days that she continued to be annoyed, more or less, with signs of labour, the os uteri never closed, and at the end of that time she gave birth to a small, but healthy male child. I have had many occasions to see persons threatened with labour, and even precipitated into it, by rheumatism of the womb.

“M. Cazeaux says nothing of the diagnosis, which I regard as one among the most difficult that can be presented to the mind of a physician. To make the diagnosis between pleurisy and pleurodyne, is often a very difficult task, and one of considerable moment, too; but to make out satisfactorily all the points of difference betwixt rheumatism of the womb and the acute inflammations of the organ, especially in the lying-in, is still more momentous. Rheumatism is, so far as my experience of it enables me to speak, most apt to attack very nervous and susceptible women, who have become weakened and reduced in strength, from whatever cause. In such subjects, it is highly desirable to get through the case without much resort to the stronger antiphlogistic measures; but if we mistake an intense metro-peritonitis for a case of rheumatism of the uterus, we shall abstain from any vigorous and eradivative employment of the lancet, under the vain hope of curing our patient by milder and less costly processes than the exhausting venesections which are so indispensable in the true inflammation.

“I have had such great difficulty in settling, to the satisfaction of my own judgment, the diagnostic differences betwixt the two maladies, in several violent cases that have fallen under my notice, within a few years, that I should be thankful for the indication of a clear method of coming to the decision. In both maladies is the fever often violent; in rheumatismus uteri there is rheumatic neuralgia of other parts, and a preceding history, that may enlighten the practitioner to his decision. In the two diseases there is equal sensibility of the abdomen; meteorismus may accompany both. The heat of skin, and frequency and volume of the pulse, are alike in each, the decubitus similar; but the tongue is clean, so far as I have noticed it in the rheumatic case. Distracted with the uncertainty and doubt in which the case is involved, I have commonly been able to satisfy my mind by a direct appeal to the organ itself, in the operation of *touching*. In both maladies the *touch* is at first painful; in metritis and metro-peritonitis it is so under all circumstances, but in rheumatismus uteri, though the first touch of the womb is painful and *quick*, yet, when the organ is gently and slowly raised upwards with the index and medius, the pain either ceases wholly, or is much mitigated, by taking off in this way the tenesmus uteri; not so in the inflammation, where every touch is more painful the more it is prolonged. I may be permitted to add, that I have heard of several cases of death from puerperal fever, where, upon an autopsy, not the least vestige of inflammation was discovered, either in the peritoneum, the uterine veins, the substance of the uterus, or any of its appendages.* Is it uncharitable to suppose that such patients died, not with the malady for which they were treated, but with another disorder, to wit, rheumatismus uteri, which demanded quite a different mode of cure? But I fear to extend this note too far; and, therefore, M. Cazeaux proceeds as follows:

* M. Cazeaux himself, near the end of this article, says, that it is often liable to be mistaken for a pure inflammation, and then treated by remedies more likely to be injurious than beneficial. If it be true that the danger of life from rheumatismus uteri be but small, as M. C. supposes, it is at least dangerous when improperly treated, under a false apprehension of its dangerously inflammatory and destructive character.

“2d. *Influence of rheumatism upon labour.*—An attack of uterine rheumatism generally retards the progress of a labour, and sometimes even renders the spontaneous expulsion of the fœtus wholly impossible. In addition to the general phenomena I have described, there are here some special ones to be met with. 1st. It is well known that a normal contraction does not begin to be painful until it has accomplished the greater part of its task, and is in the act of dilating and distending the os uteri; in other words, the true pains of labour do not begin until the instant at which the energy of the corpus uteri begins to overcome the resistance of the cervix. In rheumatism of the womb, on the other hand, the uterine contraction begins to be painful from the start, and before the least power is exerted on the neck, so that the cause of the pain is not in the violent distension of the orifice, but in the contraction itself, in other morbid circumstances, and in other relations of the nerves and contractile fibres of the womb. 2d. In a natural labour the contractions commence at the fundus uteri, and are directed towards the lower segment. In rheumatism, instead of commencing at the fundus, they commence at the painful point, and run towards the neck in an irregular manner. Again, the pains exist before the contractions of the womb, and, under their influence, when they are established, acquire a high degree of intensity. Their violence sometimes arrests the contractions before they have run through their ordinary cycle. They are, in such a case, brisk, short, and grow less and less frequent. 3d. Towards the close of the labour, when the action of the womb requires to be sustained by the voluntary contraction of the abdominal muscles, the woman, for fear of increasing her sufferings, refrains from contracting her abdominal muscles, which causes the labour to be excessively slow. The patient is in a state of extreme anxiety; the frequent pulse, the hot skin, the thirst, the urinary tenesmus, are much augmented. When the sufferings are too much protracted, she at last falls into a collapse (which is often a fortunate event for her), during which the pain is suspended. Under these circumstances, a profuse sweat has been observed, which has had the happiest effect on the rest of the labour. But in other instances the womb grows more and more painful; it is rather in a state of permanent contraction or fibrillar

vibration, than of real contraction ; the pulse becomes accelerated, and now the woman is under the influence of a metritis, which renders the labour extremely painful.

“ 3d. *Influence of rheumatism of the womb on the puerperal functions.*—One may conceive, *à priori*, that uterine rheumatism, by causing irregular or partial contractions of the organ, immediately subsequent to the birth of the child, might be the occasion of much difficulty in the delivery of the placenta ; but this is not the place to discuss that point.

“ In health, after the delivery, the womb contracts, and thus prevents hemorrhage. But in rheumatism, this return of the organ is very incomplete ; it remains above the pubis, and is large. The after-pains are now very painful, and continue for a long time. The uterine vessels are less compressed, whence may arise very copious floodings. On the other hand, the state of suffering in which the organ is placed diminishes the lochial discharge and the secretion of milk. The persistence of abdominal pain, added to the symptoms of a general reaction, might lead to the diagnosis of a peritoneal inflammation, though none such should really exist.

“ *Prognosis.*—Rheumatism of the womb is not a disease capable of causing the loss of the mother’s life, but from the pain it occasions, and the mistakes to which it leads, it nevertheless merits all the attention of the physician. In pregnancy it may cause abortion, and though it does not generally exhibit itself until the sixth month, it is always unfortunate for the child to be born before full term. We have already remarked upon the unfavourable effect produced by the disorder on the course and character of labour-pains. On many occasions it has led to the necessity of artificial delivery. It may likewise render the delivery of the after-birth difficult, and derange the course of the phenomena that ought naturally to follow after the birth of the child. At this period it is often confounded with phenomena that are purely inflammatory, and is then treated by measures that are hurtful rather than beneficial.

“ The disorder is for the most part less favourable when attacking at an early than a late period of gestation, because it has a more unfavourable influence on the progress of the gestation, as yet in-

completely established and settled, and also because it has a tendency to be reproduced again and again, before the completion of the term, and on account of its disposition to return during the labour, which it is apt to render laborious.

“ *Treatment.* 1st. During pregnancy, bloodletting, intestinal revulsives (ipecac., castor oil), baths, opiated lotions for the abdomen, anodyne potions, sudorific drinks. Such are the measures which have been most constantly successful. In cases where the affection of the uterus had followed the sudden disappearance of a rheumatic pain of some other part, revulsives should be applied to the part first affected. 2d. During labour the same means are applicable; should they fail, and the os uteri, as to its dilatation, admit of it, let the delivery be effected by means of turning, or the forceps. 3d. After delivery, sudorific drinks, anointing the abdomen with opiated ointments, baths, leeches to the vulva, and when the lochial discharge has failed, ipecac. and opium combined.”

Having now considered most of the causes, which on the part of the mother are likely to complicate labours, we will turn to those in which the child alone is concerned.

1st. *Prolapsus of the Cord.*—It is astonishing that this does not occur more frequently: for the cord is usually long, and floats about in the liquor amnii with great facility. When it does occur, it becomes a serious accident, by the interruption it causes to the foetal circulation; and unless this interruption be soon relieved, the death of the child will become inevitable. If the cord when prolapsed, be in danger of suspended circulation, we must either resort to the operation of turning, or the application of the forceps, unless the cord can be pushed with the finger, above the presenting part, and retained in this position until the presenting part has descended well into the pelvic excavation. This may be done when the labour is but little advanced; but after the presenting part occupies the excavation, the manœuvre becomes impossible, and the sooner artificial means of delivery be resorted to, the better.

2d. Too short a cord is said to complicate labour sometimes. The existence of this accident is denied by many: and even where it does occur, we have no means of detecting its existence soon enough to remedy the difficulty.

3d. *Compound Pregnancies*.—Though in many cases of multiple pregnancies, the delivery proceeds with as much facility and rapidity as where only one fœtus is present, yet occasionally the difficulties of the labour are considerably increased. In multiple pregnancies, each fœtus is usually, though not always, contained in a separate amniotic sac, and the excessive distension of the uterus renders the uterine contractions less energetic than in simple pregnancies; hence the labour is apt to be prolonged, especially during its first stage. The second stage, or the period of expulsion, is sometimes, owing to the premature period of labour, and the consequent want of full growth on the part of the fœtus, more rapidly executed than in single pregnancies. This rule, however, has many exceptions.

The nature of the presentation, of course, will modify the facility of these deliveries. If the breech of the first fœtus present, considerable difficulty may be occasioned by the delivery of the head, because the uterus, already distended with the second fœtus, can exercise but little influence upon the farther expulsion of the head.

Again, difficulty is frequently due to the presentation of some part of each fœtus over the pelvic brim, in such a manner as to prevent the descent of either portion into the excavation of the pelvis.

In all of these cases, it will be necessary to interfere manually, or instrumentally, as each particular exigency may require.

In cases of twins, it will be best to tie the cord of the first child, after it has been cut, because, though not usual, in some cases there is an anastomosis between the placental blood-vessels of the two fœtuses. The placental mass, though generally united, may be separated so as to form two distinct placentas.

4th. Unnatural size of the fœtus, whether from hydrocephalus, or abdominal enlargements, often occasion great difficulty in the delivery. In these cases, we must, when the delivery seems impossible, reduce the size of these parts, by withdrawing the fluid, &c., from the cavities containing them, by means of perforation.

CHAPTER XIII.

Puerperal Convulsion.—The term convulsion, in ordinary language, is used to express an irregular or involuntary action of the different muscles of the body, occasioned by any cause capable of irritating the nervous centres. By puerperal convulsion, we mean certain irregular movements of the whole, or a part of the muscles of the body, occurring in pregnant women, and dependent, as we shall see hereafter, upon uterine irritation.

In puerperal convulsions, the symptoms resemble very closely those of Epilepsy, so much, that the term *eclampsia parturientium* has been applied to them. In some respects, however, they differ, especially in this fact, that the *aura epileptica* is not present. These convulsions have been divided by some authors into three varieties: 1st, the Epileptic; 2d, the Apoplectic; 3d, the Hysterical. In our remarks upon this important disease, we shall speak only of the first variety, since, in our estimation, it constitutes the puerperal convulsion proper. The other varieties may exist either in the pregnant or the non-pregnant condition; and hence they will become, at least the hysterical, the subject of a separate consideration.

Again: the epileptic variety may be accompanied by cerebral congestion, and is often complicated with hysterical symptoms. In either case, the treatment will be but little changed. Puerperal convulsions may occur either during the latter months of pregnancy, or during labour, or after delivery. They are more frequent, however, about the commencement of labour, or during the progress of delivery, and rarely occur before the sixth or seventh month of utero-gestation. Dr. Lee says: "I have never met with a case of true puerperal convulsion before the sixth month of pregnancy; the spasmodic affections which have occurred at an earlier period, having been connected with hysteria, and unaccompanied with loss of consciousness." The same opinion is expressed by

Hamilton, Dewees, and others; and Ingleby says, with respect to their occurrence in the last month of gestation: "Although the paroxysm mostly appears during the dilatation of the os uteri, or on the approach of labour, still, when we recollect that in the last week or two of pregnancy, the neck of the uterus is fully developed, the subsequent changes being confined to the *os internum*, (the most sensitive part of the organ,) it cannot be surprising that, in very irritable persons, a serious impression should be made upon the brain at those periods." Where the convulsion occurs some time before labour, Gooch asserts that uterine contractions soon come on, and labour quickly follows; though this be partly true, it is not wholly so, for the uterus remains often in a quiescent state until the full period, when the child is delivered, most usually dead, though the mother may do well.

If the convulsions come on during labour, its progress is rendered much more rapid.

During labour, if convulsions occur, the uterine contractions are not suspended, but usually, though not always, the convulsion returns with each renewal of the pains. Denman, Collins, Blundell, and others, have mentioned that after the convulsions, the female remains exceedingly susceptible to abdominal inflammations.

Convulsions may occur sometimes from two to four hours after delivery. Two cases of this sort are recorded by Blundell, one of which did well after copious bleeding, while the other died, notwithstanding this treatment.

Puerperal convulsions are much more common in primiparæ than in multiparæ, and what is most singular, they occur more frequently in natural, than in preternatural presentations. This fact is denied by Ramsbotham, who says, that females with large families are more liable to be assailed. In thirty-eight cases recorded by Merriman, twenty-eight occurred in primiparæ; and Collins reports that out of thirty cases, twenty-nine occurred in those who had never borne children.

Causes.—The origin of puerperal convulsions, like its pathology, is by no means fixed; but the following may be mentioned as among the probable causes of the disease.

1st. The increased susceptibility of the nervous system in preg-

nant women, to which allusion has already been made, is doubtless one of the most common predisposing causes of puerperal convulsions. Hamilton says, "the predisponent cause is the peculiar condition of the system which accompanies utero-gestation, because circumstances occasion convulsions in that state which have no such influence in women, who are not in that state." Burns holds a similar opinion; and Hamilton thinks "this predisposition is caused by the augmented quantity of circulating fluid, the pressure of the gravid uterus on the great blood-vessels passing through the abdomen, and the increased susceptibility of impression of the nervous system," to which pregnant women are subject. The same writer thinks that these puerperal convulsions are often confounded with fits, dependent upon either hysterics or great loss of blood.

2d. Plethora is one of the causes of this disease. This fulness of habit may be constitutional, or it may be excited, during pregnancy, by the obstruction of circulation, caused by the pressure of the gravid uterus upon the abdominal aorta. Some have supposed that the sudden and constant stoppage of the catamenia, might affect the brain to a certain extent; but this is hardly possible, since more than an equal amount of blood is consumed in the nourishment of the *fœtus* in utero.

3d. The condition of the mental and moral faculties certainly has a considerable influence in inducing convulsion. Thus those females who are pregnant from illicit intercourse, and who dread exposure to the observations and taunts of an uncharitable world, seem more liable to this terrible malady, than any other class of individuals. In others the frequent excitement of gay life, the annoyances of domestic unhappiness, &c., may occasionally, in very susceptible persons, act as predisposing causes.

4th. Over-distension of the uterine fibres has been considered a cause of convulsion. Moreau asserts that those women who are delivered of a plurality of children, are more liable to this affection, than those with whom the pregnancy has been single; and he farther adds, that neither over-distension from too much water, nor from dropsy, is as productive of this disease as multiple pregnancies. Hamilton says, that convulsions are a frequent consequence

“of superabundance of liquor amnii, and of a combination of ascites and pregnancy;” and he adds, that “the only remedy in such cases, is procuring the discharge of the liquor amnii.”

5th. General infiltration of the subcutaneous cellular tissue, is said sometimes to precede an attack of convulsion. This fact is mentioned by Moreau and Lyman, but is denied by Dr. Dewees, in a note to Dr. Lyman’s assertion, in which he states that he has never yet met with a single instance of the sort. The authority upon which this fact is based is sufficiently good, to justify the physician in watching very closely a patient, in whom, during labour or the latter periods of pregnancy, this general infiltration occurs.

6th. Those persons who have been previously disposed to hysteria, apoplexy, or epilepsy, are exceedingly apt to be attacked with puerperal convulsions.

7th. Gastric irritation is mentioned as a predisposing cause of convulsion, but it can only act so, where the nervous system is unduly susceptible to impressions of every kind. Lee says, “the condition of the brain on which the loss of consciousness and convulsions depend, is obviously produced by sympathy with the nervous system of the uterus, and the fits return and increase in violence till the uterus is emptied of its contents, as it is on *them* the irritation of the nerves of the uterus alone depends.”

We might mention other causes supposed to produce convulsion, but we have already dwelt sufficiently long upon a subject involved in very great obscurity.

Symptoms.—Puerperal convulsions are usually, though not always preceded by premonitory symptoms, and these it will be important to know, for if active measures are pursued in the onset of the disease, the attack may either be entirely prevented or its severity greatly mitigated. Hamilton says, that he could not, for many years, explain the allegation of some authors, that convulsions may happen, during labour, without any previous warning. Thus Ramsbotham says, “the seizure is generally unexpected and sudden;” and Burns states, “that the convulsions may affect the patient suddenly and severely.” Collins remarks, that the attack comes on “without any premonitory symptoms.” The truth of

the matter is, that puerperal convulsions may or may not be preceded by premonitory symptoms. As a general rule, the longer these premonitions precede the attack, the lighter will be its character. There are, of course, many exceptions to this rule.

The first symptom of which the patient usually complains is pain in the head, which is sooner or later succeeded by the attack. In some cases no pain is felt, and the patient first complains of defective vision. The limbs become numb; the face flushed; twitching of the eyelids; rolling of the eyeballs in their sockets; spasm of the limbs; loss of speech; ringing in the ears. The blood rushes to the head—the body becomes convulsed, while the consciousness of the patient is entirely destroyed.

The above symptoms come on in succession, gradually, or they may suddenly appear *en masse*, producing violent convulsion, during which the respiration is short and stertorous, and gives rise, from spasm of the laryngeal muscles, &c., to a peculiar hissing noise. Blueness of the skin supervenes as a consequence of impeded respiration. Foaming at the mouth, protrusion of the tongue, rigidity of the muscles of the body, is sometimes so great that the enlarged abdomen is so compressed as to give rise to the impression that the female is not pregnant.

Besides these symptoms, Burns mentions violent pains in the stomach, followed by a fixed pain in the upper part of the back. Hamilton has never met with this symptom, and Burns says he has never seen it except in those convulsions which occur during the latter months of pregnancy, but never where the disease occurred during labour. Wiegand mentions “frightful staring and rolling of the eyes, with sudden starts from right to left, and twisting of the head to the same side by the same sudden movements,” as symptoms which often usher in the attack.

The attack sometimes comes on very suddenly in the midst of conversation, and upon recovering from the attack, the patient is frequently not aware of what has taken place. Moreau mentions the following curious case: A Swiss woman of plethoric appearance fell in labour. At the moment of rotation of the head, she was directed on account of an obliquity of the uterus to turn over to the left side; while executing this movement, she was suddenly

seized with the most horrible convulsions, from which she was relieved by copious venesection.

During the convulsion, the efforts of the female are frequently powerful, and it is with the greatest difficulty that the patient is retained in bed. In fact, the pain and contortions are so great in some cases as to resemble puerperal mania.

The duration of these convulsions is rarely more than five minutes, though sometimes they may last as long as ten or fifteen minutes. After the convulsive efforts have ceased, the patient may recover completely her consciousness; the face becomes of its natural colour, probably paler than usual, if venesection have been resorted to, the eyesight, the hearing, &c., return, and the female may escape without any further attack.

Most usually, however, one attack is rapidly followed by another, and during the intervening moments, the patient is left in a comatose condition, perfectly unconscious of what is going on. The number of attacks and the condition of the patient during an interval of half an hour or thereabouts, will depend very much upon the cause of the convulsion and upon the energy of the treatment. Where considerable congestion of the brain accompanies the convulsion, the comatose condition of the patient will be very marked, unless very copious venesection have been resorted to.

Rigby says, that where the convulsion is due "to constipation or deranged bowels, we think we have seen it more frequently connected with delirium or even temporary mania. The fits are numerous; the convulsions severe, but the cerebral congestion is not so intense, and the coma is less profound. Instead of being left in a state of torpid stupor, the patient is very restless, and at times unmanageable."

Mortality.—This is doubtless a very fatal disease, but the recorded statistics upon this subject are exceedingly variable, and scarcely lead us to any definite opinion as to the exact mortality in cases of puerperal convulsions. Moreau says that nothing is more fatal in its effects upon the fœtus than puerperal convulsions. It is less fatal in the advanced than in the early period of pregnancy.

The convulsions which occur early in pregnancy, almost always

produce the death of the fœtus, but where labour is so far advanced as to admit of speedy delivery, either by turning or the forceps, or by the natural efforts of the female, the danger to the child is much diminished.

Collins states that in thirty-four cases of convulsions, fourteen children were born alive. In forty-eight cases recorded by Merriman, seventeen were born alive, including the six which were born before the mother was attacked with convulsions. From these statistics, it would seem that not quite half of the children are lost. Puerperal convulsions are exceedingly fatal to the safety of pregnant women. Moreau states that he and Girardin, at the *Maternité*, sometimes lost all their patients, while on some occasions not more than one or two in ten died, and he adds that the gravity of the case depends greatly upon the extent to which consciousness has been lost. If the coma does not continue between the convulsive paroxysms, most of the cases recover, but if the stupor be great, the accoucheur must not be surprised if he lose a third or a half of his patients.

Out of one hundred and fifty-two cases, reported by different authors, forty-two females perished, or nearly one-third of the number attacked. Pau states that six out of ten usually die, and Collins lost five in thirty, while Merriman reports the recovery of thirty-seven in forty-eight cases.

From these various results, we see how difficult it is to arrive at an accurate conclusion. The amount of mortality is dependent upon several circumstances: 1st. The character of the treatment which has been adopted; 2d. The period of pregnancy at which the fits come on; 3d. How soon after their occurrence was the treatment commenced; 4th. How soon after the appearance of the convulsions did the delivery of the child take place.

Pathology.—It is much to be regretted that the pathology of this disease should be so little understood. The post-mortem appearances, though few in number, enlighten us very little upon this point, though, from the report of a few necropsies, enough is shown us, upon which may be based sound and practical notions in the treatment of this terrible disease.

Ramsbotham gives the result of four necropsies made by him-

self, in which the patient had died during the continuance of the puerperal convulsion. In one case, the blood was found extravasated between the dura and pia mater. In the second, no lesion whatever was discovered, except the existence of an undue fullness of the blood-vessels of the pia mater. The same thing was observable in his third case. In the fourth case, there was no solution of continuity in any of the vessels, though those of the pia mater were beautifully injected, and a section of the cerebral substance indicated the existence of an unusual number of blood-points; the ventricles were also filled with serum. From these observations, Dr. Ramsbotham concludes that "the different anatomical inquiries have not disclosed such regular appearances as to sanction the uniform deduction, that the brain was the principal seat of the disease. I suspect that, in many instances, that important organ is no otherwise implicated than through the medium of sympathetic irritation."

Blundell says, that "the more probable and immediate cause of convulsion is a pressure on the brain, and perhaps on the spinal marrow also. This pressure sometimes results from the effusion of blood, still more frequently from effused water, and most frequently of all from mere congestion."

Denman states that, in convulsions, "he has never seen an instance of effused blood in the brain, though the vessels were extremely turgid, but has always remarked that the heart was unusually flaccid, without a single drop in either the auricles or the ventricles." Hewson relates a case where some blood was effused upon the brain; and Hooper mentions one in which a coagulum of blood, weighing four ounces, was found between the dura and pia mater.

Cruveilhier relates a case, in which there was neither rupture nor congestion of the blood-vessels; and Dr. Collins adds, "I conceive we are quite ignorant as yet, of what the cause may be: nor could I ever find, on dissection, any appearance to enable me to hazard an opinion on the subject."

Moreau says, that frequently we discover no pathological lesion, but in many cases "the vessels of the brain are distended with

blood, its substance roughened and injected, and the ventricles filled with a serosity more or less abundant."

From the above examination of the opinions of different authors, in regard to the morbid changes productive of puerperal convulsion, it is easily seen that as yet but little is known, calculated to determine positively the pathology of the disease. We think, however, that enough is known to point out to the practitioner safe practical rules in the management of the disease.

We believe the exciting cause of puerperal convulsion may be traced to the peculiar state of the nervous system, engendered by pregnancy. This change in the female during pregnancy, is not only observed in the nervous system, but equally great are the changes produced in the system, of circulation and respiration; the pulse is fuller and more rapid than under ordinary circumstances; the blood is more rich in fibrine, and the patient is frequently subject to cephalalgia, fulness of the head, precordial oppression, &c. As to the respiration, its movements are more rapid, and frequently accompanied with oppressed and difficult breathing.

These are changes which the existence of pregnancy produces upon every constitution, in a greater or less degree. Their effect is, first, to exalt the nervous excitability; 2d, to impede the circulation, causing an undue accumulation of blood in the brain. If, in this state of things, with this predisposition, any undue excitement, such as violent moral emotions, constipation, pressure upon the nerves of the uterus during the contraction of the organ, or upon the nerves contained within the pelvic excavation, be present, convulsions may take place.

That a certain condition of the uterine system, producing undue excitement of the nervous centres, and irregularity in the distribution of the blood, is the cause of puerperal convulsion, is apparent, for the following reasons: 1st. Uterine diseases of a certain class will produce convulsions, even when pregnancy does not exist; 2d. Pressure upon the uterine or sacral nerves, is frequently sufficient, of itself, to produce convulsions, when a predisposition to such attacks actually exists; this is seen, where the system is unduly susceptible to different impressions; 3d. Causes which will

produce convulsions in the pregnant condition, fail to do so, where pregnancy does not exist; 4th. Pressure of the uterus upon the abdominal aorta, by impeding the freedom of the circulation, is calculated to produce congestion of the brain; 5th. Convulsions are relieved by bleeding, a remedy of inestimable value in congestion of every kind; 6th. Artificial delivery, by relieving the uterine distension, &c., is productive of very great benefit in cases of convulsion; 7th. A majority of the post-mortem appearances which have been made, exhibit either a congestion of the blood-vessels of the brain, or an effusion of blood or of serum; and *it is probable*, that where these morbid appearances are absent, the congestion had been relieved by copious venesection.

Treatment.—Uncertain as is the pathology of puerperal convulsions, no doubt exists in the mind of any practitioner as it regards the treatment of the disease. Though we cannot agree with Gooch in the opinion, that in all cases one of our best means of establishing the true pathology of any disease, is to watch with care the effects of different plans of treatment, yet we think where pathological investigation fails to throw its usual light upon the character of disease, that the nature of the treatment, if successful, fully authorizes the practitioner in adopting a certain view in regard to its character, almost as conclusive as would be that derived from post-mortem examinations.

The most important remedy, in the treatment of puerperal convulsions, consists in the free use of the lancet. Venesection is, as all know, the most effectual means possessed by the practitioner, for relieving the congestion or inflammation of any organ of the body. This is a point in therapeutics denied by none, and the principle is peculiarly applicable to the treatment of puerperal convulsion, since nothing will save the patient, unless the copious abstraction of blood from the arm be resorted to very early in the disease. The blood must be drawn *pleno rivo*, so as to make a quick impression upon the disease. Hamilton says, “take away forty ounces, and if the patient be not better, take away forty more.” In this opinion, Denman, Gooch, &c., fully coincide. Blundell says we must bleed early, and “if the smaller abstraction; if, for instance, a bleeding of twenty or thirty ounces be suf-

ficient, let this content you; but if you find the convulsions continue, and the afflux of blood remains, with due prudence your bleedings must be repeated." Gooch says, "give me the lancet and deprive me of all other remedies, and I will do more good with it singly, than with all others deprived of this, put together." Hamilton says, "experience has taught me, in directing the first bleeding, to disregard peculiarity of constitution, for the most delicate persons require the same quantity to be subtracted at first, as the most robust. In a large proportion of the individuals in the lower ranks, who have been apparently saved by this practice, the diet had previous to the occurrence of the disease, been for months, perhaps for years, chiefly or entirely farinaceous, and in several of the cases in the better ranks, the subjects were of a feeble, delicate habit. The symptoms were so urgent, in some of the patients of the latter description, when the author's aid was requested, that he recommended a vein to be opened at once in both arms. One remarkable illustration of the efficacy of this practice occurred many years ago. The lady was of a very weakly habit, having been for years, almost constantly, an invalid. After having undergone considerable fatigue, when seven and eight months pregnant of her second child, she complained of severe, crampish pain in the stomach, for which thirty drops of laudanum were administered. Soon after this, violent convulsions came on, and the author was sent for. He directed sixty ounces, by weight, of blood to be drawn; and although the fits occasionally recurred, and she continued in a state of insensibility for three days, (premature labour having taken place in the meanwhile,) she eventually recovered. In this case the increased quantity of blood was drawn, in consequence of the patient having had an opiate, and this is the only instance of recovery, where a dose of laudanum had been given, previous to the use of the lancet, which has fallen under the notice of the author."

We have made this long extract from the work of Dr. Hamilton, for the purpose of showing the absolute necessity for copious bloodletting, but at the same time we would caution the reader against his remark that we should *disregard peculiarity of constitution* in the treatment of convulsions. Venesection is certainly

our sheet anchor in these cases, but no prudent practitioner should fail to make a distinction between the treatment of a plethoric and robust female, and one whose constitution was fragile and anæmic. Bleed, then, copiously, but let the amount drawn be modified in accordance with the constitutional vigour of the patient, and where the constitution is feeble, moderate venesection, aided by the vigorous employment of topical depletion, counter-irritants, &c., will usually effect as much as a more copious abstraction of blood.

When the bleeding has been carried sufficiently far, if the patient be not relieved, we should resort to the application of cups to the back of the neck, at the same time that leeches are applied over the temples or the mastoid process. Evacuation by these local means, produces a highly beneficial result when preceded by general bleeding, but valuable as they are, no physician would be justified in relying upon them independent of general depletion, in the treatment of puerperal convulsions. Remember, then, that the cupping and leeching should always be preceded by bleeding from the arm.

Blisters to the back of the neck will be found useful as a depletent and counter-irritant, but they should not be resorted to until general and local bleeding have been employed to their fullest extent. The extent to which the abstraction of blood may be carried, will be indicated by the relief afforded the patient. If the spasms have subsided, and if, during the intermission, consciousness return, we may be certain that our remedies have acted well, and they need not be repeated when this relief seems permanent. In some cases, however, no relief is afforded, though the depletion may have been pursued as far as prudence would dictate, and here we must trust to the auxiliary means to be mentioned hereafter. It is difficult to say exactly, how far depletory means may be carried without injury to the patient, for different persons will bear the loss of different amounts of blood. The judgment of the practitioner should be the guide in this case, and it will teach us that where the general fulness has been reduced, where the pulse is soft and feeble, where the skin is pale, and the extremities cold, the depletion should be carried no farther, and this is the point at

which, even though the patient be not relieved, no more depletion should be resorted to.

When all possible benefit has been derived from general and local bleeding, and from blistering, the application of cold to the head, and of warm sinapisms to the feet will be found exceedingly serviceable.

The use of cathartics will be found beneficial as a means of evacuation and counter-irritation.

When the above treatment has been faithfully adopted without relief to the patient, it will become a question for consideration, whether artificial delivery should be resorted to? This must not be thought of unless the mouth of the uterus be well dilated or dilatable. During the convulsions, the os uteri expands very rapidly, and we must hold ourselves ready to effect the delivery as soon as these parts are in a proper condition. The relief from delivery is sometimes, though not always, very great. But turning or the forceps should be resorted to whenever the above means have failed to arrest the disease.

CHAPTER XIV.

Uterine Hemorrhage.—In a previous chapter, the peculiar connexion subsisting between the foetal membranes and the internal surface of the uterus, has been fully explained; and any separation of this connexion must be followed by a rupture of the utero-placental vessels, and by a discharge of blood from their lacerated extremities. This separation of the membranes from the walls of the uterus, this laceration of the blood-vessels passing from the foetal membranes toward the uterus, and vice versa, is invariably the direct cause of uterine hemorrhage or flooding.

The causes of the separation of the ovum from the uterine walls are various; thus it is at times due to mechanical violence, or it may depend upon atony or spasm of the uterus, upon the too plethoric condition of the female, or upon too short a cord, &c. But, it is probable that by far the most common cause, as we shall see when treating of abortion, is, some diseased condition of the ovum and the membranes by which it is surrounded.

Uterine hemorrhage may occur at any time during the term of utero-gestation, or it may occur after the delivery of the child, but before that of the secundines, or after the extrusion of the last.

We shall treat of uterine hemorrhage, under four separate heads:—

1st. That variety of flooding which occurs during the first half of the term of utero-gestation.

2d. Hemorrhage occurring during the last half of pregnancy.

3d. Hemorrhage occurring between the birth of the child and that of the placenta.

4th. Hemorrhage occurring after the extrusion of the secundines.

Before treating of these varieties, it will be necessary to ascertain, with precision, the way in which uterine hemorrhage may be arrested. It has already been stated that the flow of blood pro-

ceeded from the open mouths of the lacerated uterine blood-vessels, and it is perfectly clear that these open-mouthed vessels must be closed, before the flooding can be arrested; and this closure is effected in several ways: 1st. By the contractions of the uterine fibres, which serve as ligatures, as it were, to the lacerated extremity of the blood-vessels. This is one of the most efficient means of arresting uterine hemorrhage; hence it becomes the duty of the accoucheur, in all cases of dangerous hemorrhage, to use every effort in his power to induce a firm contraction of the uterus. This rule is applicable in every form of uterine hemorrhage but one, viz., the *placenta prævia* cases. 2d. The flooding may be arrested by the formation of clots, at the mouths of the bleeding vessels, sufficiently large and firm to arrest any farther flow of blood. These clots are said by some to become inflamed, and subsequently organized; whether this be true or not, is a matter of but little importance, since the formation of an ordinary coagulum is sufficient in this, as in ordinary cases of hemorrhage, to arrest the flow of blood, especially when assisted by the gradual but firm contraction of the uterine fibres.

I. Those hemorrhages which occur during the first half of pregnancy, are generally less abundant than in the other varieties, because, at this time, the blood-vessels of the uterus, whence the flooding proceeds, are as yet much smaller than at a more advanced period of pregnancy. But, though the positive danger, in these cases, be less, yet the pernicious effects which result from continued and oft-repeated hemorrhages, are well calculated gradually to undermine the constitutional vigour of the patient.

The amount of blood lost, of course will depend upon the advance of pregnancy, upon the duration of the discharge, and upon the degree of detachment which has taken place. In the earlier months of pregnancy, the hemorrhage may be slight or abundant; and in the former case, it is usually manageable, while in the latter there is great danger of abortion, especially if uterine contractions accompany the discharge. The occurrence of abortion, though an unpleasant circumstance, is not to be regarded as unfavourable in the management of these cases, because, after the uterine contents have been evacuated, we can, with much more certainty, expect

to arrest the hemorrhage, by proper treatment, than where the partially detached ovum still remains within the uterus. In this variety of hemorrhage, if the blood is discharged in large quantities, the expulsion of the ovum may take place immediately; but if where the blood flows gradually, the discharge of the uterine contents will be delayed a longer or shorter time. In the former case, the danger to the mother is less than in the latter, because, as we have already said, the certainty of the cessation of the hemorrhage may be calculated upon, as soon as the whole contents of the uterus are expelled. In those cases, where the bleeding is small in quantity, but continually repeated, as the detachment increases, the aggregate amount of blood lost may be so great, as to threaten the life of the patient, unless the physician interfere, by inducing the discharge of the embryo, and its enveloping membranes, in the way described in our chapter on Abortion.

Where a large amount of blood has been lost, the patient will present the following symptoms: cold and damp extremities; pallor of the countenance; pulse frequent, (beating often 140 or 150,) small and intermittent; syncope; weariness in the limbs, &c., &c. These symptoms are fraught with danger, and unless your patient be soon relieved, the case will be beyond the reach of remedial treatment.

In cases of this kind, it becomes the duty of the physician to inquire, first of all, whether the ovum and its enveloping membranes, or a portion of them, have been discharged. If the whole contents have been expelled, then the flooding may be arrested, either by the natural contractile power of the uterus, or by the employment of remedies applicable in such cases, and presently to be pointed out.

Where the whole contents or a part of them are still retained within the uterus, we may rely upon it that there is danger in the case. But how are we to determine whether the uterus has been emptied or not? 1st. By an examination of the discharges. 2d. By an accurate exploration per vaginam. This examination must be made with gentleness, and where the membranes are found protruding through the os uteri, it will be best, if the occasion require, to remove them. Where, however, they cannot be felt,

nothing should induce us, during the early months of pregnancy, to introduce the finger through the cervix uteri, for the purpose of extracting the uterine contents, unless the life of the patient be seriously involved.

It sometimes occurs, that even after the discharge of the uterine contents, the bleeding continues from some peculiar idiosyncrasy of constitution, or from a non-contracted uterus where the flooding is kept up by some hemorrhagic tendency, the use of astringents internally, and cold externally, will constitute our plan of treatment. Should these fail in arresting the hemorrhage, Blundell recommends touching the gums with mercurials, and the use of astringent injections into the uterine cavity. A scruple of alum dissolved in a pint of water is one of the best astringent injections. In treating these cases, the patient of course should be kept in the recumbent position, at the same time that stimulating articles of food, &c., should be forbidden. But if the flooding, after the discharge of the uterine contents, be continued on account of a non-contracted condition of the organ, then our main plan of treatment will consist in inducing the contraction of the organ, and this may be accomplished by the use of ergot, cold applications, and the application of galvanism, as advised by Dr. Radford. To this treatment may be added, rest in the recumbent position, mild, unstimulating diet, and the use of astringents and opiates. The sugar of lead, combined with opium, is one of our best means of producing an astringent effect upon the blood-vessels, at the same time that the opium acts beneficially in allaying irritation of the system.

But what is to be done, if, before the discharge of the uterine contents, there should be only slight hemorrhage? In this case we have to fear the occurrence of abortion, and the pernicious effects of small bleedings upon the constitutional vigour of the patient. It is our duty, then, to prevent the occurrence of abortion, and to diminish the amount of blood lost, and this may be done by adopting the following plan of treatment. Your patient must be kept in the horizontal position upon a hard mattress and in a cool room. Her diet should consist of solid, but unirritating food. No stimulating drinks should be allowed, and the nervous

system should be kept in a state of quiet tranquillity. If febrile symptoms, with fulness of the blood-vessels, should occur, they should be combated by means of refrigerants, cautious bleeding, and gentle aperients. To this treatment, we may add the use of astringents, as the infusion of roses and sulphuric acid combined, or the acetate of lead and opium in the form of pills. Cold applications of *ice*, or vinegar and water, may be applied about the pelvis, at the same time that counter-irritants to some portion of the body may be employed.

If, notwithstanding this treatment, patiently persevered in, the bleeding still continues, and if the life of the patient be endangered, then it will become necessary as a last resort, to evacuate the uterus of its contents. This may be done by passing the bulk of the hand into the vagina and searching for the *os uteri*; we must introduce the first and second finger through the cervix into the cavity of the uterus. This must be done with the greatest gentleness; and when it is accomplished, (the body of the uterus being fixed with the external hand,) we must search for the ovum (or a portion of it) if part has been already expelled, and remove it from the uterus. This operation must never be resorted to unless the life of the patient is in extreme danger from any renewal of the hemorrhage.

In those cases in which large quantities of blood gush forth from the uterus, the danger of abortion is imminent, and if uterine contractions accompany the hemorrhage, its prevention is scarcely possible. Our efforts should, as long as the condition of the patient permits, be unremittingly directed to the arrest of the hemorrhage, and the prevention of abortion in the way already described.

In regard to the use of the tampon, (which is nothing more than a plug of sponge, or linen, or cotton, introduced into the vagina for the purpose of preventing the flow of blood,) the profession is not united. Some extol its use on all occasions, while others maintain, that in almost every case it is injurious. In uterine hemorrhage, occurring previous to the fifth month of pregnancy, the tampon may, under certain circumstances, be beneficially resorted to. Where the amount of blood is excessive, and threatens

the life of the patient, the tampon may be employed, provided the uterine contents have not been evacuated. If, however, the uterus has been emptied, we would prefer the induction of uterine contraction, &c., to the use of the tampon, because the latter, by preventing the exit of the blood, tends to distend the uterus, and to interfere with that contraction of the organ, which is essential to the arrest of the hemorrhage. Another disadvantage in the use of the tampon, after the uterus is evacuated is, that if the organ has attained a considerable size, it is capable of containing such an amount of blood, the loss of which would seriously injure the patient. To be sure, it has been asserted, that in arresting the flow of the blood, we render its coagulation more certain, and we know that this coagulation is one of the means by which the hemorrhage is stopped; but we think, that after the uterus is emptied of its contents, (especially if it has attained the size, which it is wont to do at the third, fourth, or fifth month of pregnancy,) the advantages derived from the use of the tampon are more than counterbalanced by the disadvantages; hence, we would lay down this invariable rule, *that the tampon should be applied in uterine hemorrhage, before the uterus has been emptied of its contents, but that after this has taken place, its application would prove injurious, and that the better plan, in these cases, would be to use our best efforts to induce the permanent contraction of the uterus, at the same time that we employ all the means in our power, capable of diminishing the flow of blood.* We will find presently, that this rule is especially applicable in hemorrhages occurring during the latter months of pregnancy.

2. The next variety of uterine hemorrhage to be described, is that which occurs during the latter months of pregnancy. Flooding, in this case, may be dependent upon two circumstances: first, the implantation of the placenta over the mouth of the uterus; second, the detachment of the placenta from the walls of the uterus.

a. Hemorrhage occurring, in consequence of the implantation of the placenta over the mouth of the uterus, (termed placenta prævia,) has been designated by obstetrical writers as "*unavoidable hemorrhage.*" This peculiarity in the position of the placenta, was first noticed by Smellie and Levret, about the middle of the 18th cen-

tury. In 1776, Dr. Rigby, of Norwich, in an article upon this subject, seems to have appropriated the discovery to himself; but it cannot be doubted, that the originality belongs to the two distinguished obstetricians, to whom we have alluded. Those, who are interested in investigations of this kind, may consult, with benefit, Lee's Midwifery, at page 352, et. seq.

The cause of the flooding in this case, is thus explained: the placenta is attached over the cervix uteri, and as this undergoes effacement and dilatation, during the latter months of pregnancy, the blood-vessels connecting the uterus with the placenta, become ruptured, and hemorrhage is the consequence. Each uterine contraction, producing an increase of detachment, is of course followed by a renewal of the bleeding.

In placenta prævia cases, the flooding usually commences about the sixth or seventh month of pregnancy. Its occurrence is spontaneous, coming on suddenly, while the female is in a state of perfect quietude. The other form of hemorrhage may be traced usually to some accident, and hence they have been termed "*accidental*." The blood, in placenta prævia cases, gushes forth from the parts, and occasionally, the quantity of blood discharged is so great as to produce asphyxia and death. At each accession of uterine contraction, the bleeding is increased; and *these*, which in the ordinary forms of hemorrhage, constitute the salvation of the female, render the danger much more imminent.

Though these peculiarities, viz., the sudden discharge of blood; its discharge, independent of accident, and during the quietude of the patient; its increase, during uterine contractions, and its occurrence about the sixth or seventh month of pregnancy, may excite our suspicions as to the nature of the case, yet we can only arrive at certainty on this point by an examination, *per vaginam*; and here it will be necessary, that the student should, by a constant examination of the placenta, accustom himself to the feel of this organ. By a careful examination, it is at length ascertained that the placenta is presenting over the os uteri, and we must adopt our treatment accordingly.

Treatment.—If the bleeding be arrested, and the patient be weak, and in danger of asphyxia, we should permit every thing

to remain in *statu quo*. The female should be kept in a recumbent position, and no examination, per vaginam, should be made, lest by disturbing the coagula formed, we should endanger a renewal of the hemorrhage. Dr. Hamilton says, that the flooding is not arrested by the formation of these coagula within the mouths of these open vessels, but by a retraction of these vessels within the tissue of the uterus, by which they are constricted, and by a change which the separated portion of the placenta undergoes, analogous to adhesive inflammation. Any farther bleeding, he says, must be due to a farther separation of the placenta. However well founded may be these views, we cannot doubt that the collection of coagula around the open-mouthed blood-vessels, forms one of the principal elements in arresting the hemorrhage, at least for a time. To favour this coagulation, the introduction of the tampon will be found of essential service. To its use, however, Dr. Hamilton objects, 1st, because it will not arrest the bleeding; 2d, that if the blood be prevented from passing out of the vagina, it may accumulate within the uterine cavity, and in proof of this latter assertion, he cites in his work upon Midwifery, an interesting case. But we do not believe that the tampon fails to aid in the arrest of the bleeding. Nor can we imagine that any serious amount of blood can collect in the cavity of the uterus, which is already filled with the fœtus, the liquor amnii, &c. Dr. Hamilton does not advise either plugging the vagina or rupturing the membranes, but thinks the presenting part may be pushed back, and a foot hooked down. His objections to rupturing the membranes are: 1st, their rupture may fail to bring on pains; 2d, if the discharge of the waters fail to bring on labour, much time is lost, and much difficulty experienced in turning. The membranes, he says, ought never to be ruptured in placenta prævia cases; and he adds, that their rupture was not advised by Puzos, as was supposed by Dr. Davis. Dr. Lee objects also to the use of the tampon in these hemorrhages, and says that where the os uteri is undilated, and where the flooding is excessive, it will be best to introduce a finger or two into the uterus, and hook down the feet, which are usually found near the mouth of the womb. His views correspond very nearly with those of Dr. Hamilton and others; but

still, we do not hesitate to advocate the use of the tampon in these cases, and in this opinion we are supported by many excellent obstetricians, whose authority we might cite, if our limits permitted. But what must be done if the bleeding continue? In this case, perfect quiet, the introduction of the tampon, and the elevation of the pelvis, will constitute the necessary treatment, until the soft parts become dilated or dilatable, so as to permit the introduction of the hand into the uterus, for the purpose of acting in the way to be presently described.

Again, where the bleeding has stopped, and the exhaustion of the patient is not extreme, we should deliver the child so soon as the soft parts will permit. Nothing but the extremest danger can justify us in entering the uterus, before the soft parts are in a dilated or a dilatable condition. The profuse bleeding acts exceedingly favourably in inducing relaxation of these parts; but until this state of things is brought about, we must wait, and during this necessary delay, we must employ all the means to which we have already alluded, which are calculated to diminish, as much as possible, the flow of blood. So soon as the os uteri becomes soft and dilated to the size of half a crown, we may, without unnecessary risk, gradually introduce the hand into the uterus for the purpose of adopting one of the three modes of treatment recommended by obstetricians.

1st. If the strength of the patient be not greatly exhausted, the hand, gently passed through the os uteri, should be insinuated between the placental mass and the walls of the uterus into the cavity of the organ, and when *there*, the feet should be seized, and turning effected in the manner to be described hereafter. This is the plan most usually adopted by obstetricians, in placenta prævia cases. The objection to it is, that the necessary separation of the placenta from the uterus, for the purpose of introducing the hand into the uterus, occasions an increase in the flow of blood; hence it is said that this mode is not applicable to those cases, where the strength of the patient has been much exhausted by the loss of blood.

2d. Where the patient's exhaustion is extreme, and where we have reason to fear any farther loss of blood, Blundell advises, that the placental mass shall be perforated by forcing the hand through

it, into the uterine cavity, when the feet may be seized, turning effected, and the child extracted through the opening made in the placenta.

3d. But another mode of treatment in these cases, has been lately proposed by Drs. Simpson and Radford, and before entering into the detail of the facts upon which this new plan is based, it is necessary to premise that Dr. Simpson does not advise its adoption in every case, but only under the following circumstances: "In severe cases of unavoidable hemorrhage, complicated with a rigid and undilated os uteri, in which turning would be either impossible or hazardous; in most primiparæ; in unavoidable hemorrhage, with premature labour, and an undeveloped condition of the os and cervix; in placenta presentations with distorted pelvis; in cases where the extreme exhaustion of the patient forbids turning, and when the fœtus is ascertained to be dead, or is premature and not viable."

We will now enter into an examination of the views entertained upon this subject by Dr. Simpson. From observations made upon a large number of placenta prævia presentations, in which the placental mass was expelled before the child, the following summary is deduced:

"1. The complete separation and expulsion of the placenta before the child, in cases of unavoidable hemorrhage, is not so rare an occurrence as accoucheurs appear generally to believe.

"2. It is not by any means so serious and dangerous a complication as might *à priori* be supposed.

"3. In nineteen out of twenty cases in which it has happened, the attendant hemorrhage has either been at once altogether arrested, or it has become so much diminished, as not to be afterwards alarming.

"4. The presence or absence of flooding after the complete separation of the placenta, does not seem in any degree to be regulated by the duration of time intervening between the detachment of the placenta and the birth of the child.

"5. In ten out of one hundred and forty-one cases, or in one out of fourteen, the mother died after the complete expulsion or extraction of the placenta before the child.

“6. In seven or eight out of these ten casualties, the death of the mother seemed to have no connexion with the complete detachment of the placenta, or with results arising directly from it, and if we do admit the three remaining cases, (which are doubtful,) as leading by this occurrence to a fatal termination, they would still only constitute a mortality from this complication, of three in one hundred and forty-one, or of about one in forty-seven cases.

“7. On the other hand, under the present established rules of practice, one hundred and thirty-three mothers died in three hundred and ninety-nine placental presentations, or about one in three.”

It would seem then from the results above stated, and for the details of which we would refer to Dr. Simpson's interesting pamphlet, that in placenta prævia presentations, the complete detachment and expulsion of the placenta, previous to the birth of the child, is neither so rare nor so dangerous a circumstance, as has been generally supposed. The explanation offered as to the mode in which the bleeding is arrested in these cases, after the complete detachment of the placenta, varies very materially. Ramsbotham says, “I think it may be satisfactorily explained how the woman's life is preserved. The head of the child is pushed down upon the os uteri, which suddenly gives way. Under its relaxation, the placenta is loosed from its previous attachment and falls down before the head, which now comes into immediate contact with the bleeding vessels, and by mechanical compression closes their mouths; from this moment, therefore, the loss of blood is suspended, and the head is afterwards expelled by uterine action.” Campbell says, that “it may be presumed that in these cases the fatal event must have been prevented by the quick descent and consequent pressure of the body of the child upon the point whence the placenta had been detached.” But Dr. Simpson very forcibly remarks that this explanation is erroneous, 1st, because in some of those rare instances, in which the bleeding continued notwithstanding the total separation of the placenta, the child's head did present, but did not by its compression arrest the hemorrhage. 2d. Because, in many of the cases cited, the hemorrhage ceased after the entire detachment of the placenta, although neither the head

nor any portion of the child presented, which was capable of arresting the flooding by mechanical pressure.

The following statistical table, with the accompanying remarks of Dr. Simpson, prove, beyond doubt, that the explanation offered by Campbell, Ramsbotham, &c., is not correct :

“ In a considerable proportion of cases collated into our general table, the child presented preternaturally with the foot, feet, arm, or shoulder. These parts are all of such a form and size, that they could not be applied as compresses, upon the part of the uterus which was exposed by the previous detachment of the placenta, and yet the hemorrhage appears to have been as *constantly* and as *completely* arrested in those instances when once the placenta was perfectly separated, as it was in cases in which the head or breech of the child came afterwards to press upon the cervix uteri. The following tabular view will demonstrate this important point, by showing the number of instances in which a lower or upper extremity came down after the expulsion of the placenta, and the degree of hemorrhage that was observed to follow in these cases.

Degree of hemorrhage after separation of placenta in	Footling Presentations.	Arm or shoulder presentations.	Total.
Great,	—	1	1
Considerable, . .	1	—	1
Slight,	—	2	2
Little or none, . .	2	8	10
Not stated, . . .	2	7	9
	5	18	23

“ These data prove, that ‘ great’ or ‘ considerable’ hemorrhage, after the expulsion or detachment of the placenta, is not more liable to occur when the retained fœtus afterwards presents by an upper or lower extremity, than when it comes down with the head or breech upon the exposed surface of the cervix uteri. The proportion of cases in which the hemorrhage continues is not greater under the one set of presentations than it is under the others. And these observations seem to me to afford amply sufficient grounds for rejecting the idea, that the prevention of the hemorrhage after the complete separation of the placenta, is to be ex-

plained by the presenting part of the infant coming down, and acting as a compress upon the exposed orifices of the uterine vessels. It may be an auxiliary, but it is not a primary or essential cause of the suppression of the hemorrhage. For the mechanism of the arrestment of the flooding, in cases in which the placenta happens to be completely detached, and the child left in utero, is, I believe, of a totally different kind. But, in order to understand it, let me first premise, that obstetric pathologists are in all probability incorrect in the rationale which they currently give of the immediate source of sanguineous discharge in instances of flooding—whether accidental or unavoidable—from partial separation of the placenta.”

Thus far, we think, Dr. Simpson has proved that the detachment and expulsion of the placenta, previous to the birth of the child, is not a rare circumstance; that it is followed usually by an arrest of the hemorrhage; that this arrest of the bleeding is not due to the mechanical compression of the presenting part.

To what is this arrest of hemorrhage due? It is maintained by most obstetricians, that uterine hemorrhage is occasioned by the rupture of the vascular connexion subsisting between the placenta and the uterus, and from the open mouths of these lacerated vessels the blood proceeds, and will continue to flow, unless these vessels are rendered impervious either by the formation of coagula, or by the contraction of the uterine fibres. Dr. Hamilton, in opposition to the opinions of Ramsbotham, Davis, Dewees, Ingleby, Lee and others, maintains that the hemorrhage does not proceed from the exposed internal surface of the uterus, but “from the separated portion of the placenta, more than from the ruptured uterine vessels.” In this opinion, Dr. Simpson coincides; and we make the following extract from his pamphlet, for the purpose of presenting his whole train of reasoning upon this subject. He says: “To understand the true source of the flooding, in unavoidable and accidental hemorrhage, the cause of its continuance, when the separation of the placenta is partial, and the mechanism of its arrestment, when that separation is complete, we must take into consideration the following different points: *first*, the maternal portion of the placenta is of a cavernous structure; that is to say, it con-

sists of a series of maternal cells or dilatations, or, perhaps more properly speaking, of one large maternal vascular bag, into which the blood of the mother is conveyed by the utero-placental arteries, and from which it is removed by the utero-placental veins; *secondly*, the vascular maternal cells, or immensely dilated capillaries, which contain the blood of the mother in the placenta, communicate so freely with each other, throughout all the different portions of the organ, that the blood which has access into one part, may in this way be rapidly diffused into the other portions of the placental mass; and, *thirdly*, the deciduous or uterine surface of the placenta has no vital, muscular, or contractile power, by which it can constrict the orifices of the vascular tubes, which pass from the uterus into it, when these tubes are ruptured, in consequence of a greater or less detachment of the organ from the interior of the uterus. From the consideration of these premises, it will readily appear, that when a small portion of the placenta is detached, it occasionally occurs, as I have already shown in the early part of the present essay, that the consequent hemorrhage is sometimes so great as to be dangerous, or even fatal, in its extent. Its amount, under this and other circumstances, may be also regulated and increased by the occurrence, (in consequence of uterine contraction, or otherwise,) of any *laceration* in the detached portion of the placenta itself; for when the substance of the organ is torn, its vascular maternal cells will be more freely opened into and exposed, and a more profuse discharge be allowed to issue from them. We may further easily conceive, why the discharge should sometimes be actually more abundant when the detachment of the placenta is slight, than when it is greater in degree. For the quantity of blood passed into the maternal vascular structure of the organ, and consequently the quantity liable to escape from its unattached surface, will, in some respects, depend upon the extent of vascular placental connexion which continues between it and the uterus. In other words, the intensity of the resulting hemorrhage will be regulated as much, or more, by the extent of placental surface which *still* remains in attachment to the mother, as by the extent of surface which is *already* detached; for the freedom with which the blood is supplied to the placenta will affect the violence of the flooding,

equally, or more so, than the freedom with which that blood is allowed to escape from the open orifices of its ruptured vessels.

“Probably, in most cases, the hemorrhage will reach its maximum, when the quantity of blood which enters the placental cells by the adherent portion, is equal to what can reach and escape from the open orifices of the separated portion. Any additional separation after this will tend rather to diminish the flooding, as less blood will be carried into the placenta, from the number of its channels of supply being diminished. Most accoucheurs seem to believe that the greater the degree of detachment, the greater will be the hemorrhage, and hence, we are earnestly cautioned, in the operation of turning in *placenta prævia*, not to separate more of the placenta from the cervix uteri, than is absolutely necessary to permit of the passage of the hand. Theory, as well as experience, would seem to throw the greatest doubts upon the soundness and propriety of this rule. If at all true up to a certain extent of separation, it certainly does not hold good in regard to the detachment, when carried to some degree further.

“There is an additional anatomical reason why the accompanying hemorrhage should be excessive, in some cases where a very small portion of the edge of the placenta only has been separated. I have already quoted from Dr. Hamilton a case of this kind, which proved fatal, and where the ‘area of the separated placenta was less than a square inch.’ The largest of the maternal vessels belonging to the placenta, is that which Meckel, Jacquemier, and other authors, have described under the name of the circular sinus of the organ. It courses round the circumference of the placenta, in some parts being of a great size, and at other points more or less contracted, or even absent. I have usually found this maternal placental vessel of great dimensions in several different parts of its course. In the cases in which excessive hemorrhages occur, when a small portion only of the edge of the organ is detached, I believe the danger and fatality of the result are to be ascribed to the fact, that some portion of the course of this large circular sinus has been opened, and thus a rapid and free tide of maternal blood allowed to escape from the disrupted part of this uncontracting tube.

“In all instances, then, of hemorrhage from partial separation of the placenta, I hold that the blood issues principally, if not entirely, from the uncontracted and uncontractible maternal orifices, that belong to the external surface of the separated portion of the organ, and that the maternal blood is supplied more or less freely to these orifices, in consequence of the free communication existing among the different maternal cells, and from these cells being kept filled with blood through the utero-placental vessels of that portion of the placental mass which continues to remain fixed and attached to the uterus.

“Further investigations will probably show, that the greatest quantity of blood that escapes, flows from the exposed orifices which lie nearest to, or are actually involved in, the line of separation between the placenta and uterus. Along this line of separation, and in its immediate neighbourhood, these orifices, consisting mainly of apertures in the large and torn *decidual* veins, will be for a time kept more stretched and patulous than in the other portions of the detached surface; and more especially will this hold true, if there exist any tendency in the uterus to detach itself more and more from the placental surface along this line of junction, by constant contractions. Under such circumstances, the placental orifices alluded to, and those in their immediate vicinity, will afford, not only the freest, but also the nearest channel for the discharge of the mother's blood flowing into its maternal cells.

“In cases of partial detachment of the placenta from the interior of the uterus, the attendant degree of hemorrhage is also, no doubt, regulated by another important circumstance, namely, by the condition of the blood itself in the separated portion of the organ. If the blood in the maternal cells of that portion continues still to remain fluid, it will be ready to escape from every ruptured orifice upon the detached placental surface. Hence, when a considerable portion of the placenta is at once and suddenly separated, the discharge is sometimes excessive, until the blood in the tissue of the detached part becomes more or less coagulated. Gradually, by its coagulation and infiltration into the structure of the separated portion of the organ, it obstructs the maternal cells of that part, and consequently more or less completely arrests the discharge.

“It is in fact to this infiltration and coagulation of blood in the detached portion of the organ, that we are, as Gendrin has well shown, to look for an explanation of the occasional temporary cessations of those floodings which are so frequently observed during the latter periods of utero-gestation, in cases of *placenta prævia*. It is well known, that when the placenta presents, hemorrhage is liable to occur at intervals, for days and weeks, or even for months previously to the completion of the full term of pregnancy. Each of these hemorrhages depends upon a partial detachment of the expanding surface of the *cervix uteri* from the unexpanding surface of the placenta. For the expansion of the cervix uteri, during the last periods of pregnancy, is known to produce its detachment from the placenta, when the placenta is implanted upon it, exactly in the same way as the contractions, or rather retractions, of the same part during labour, lead to a similar result.

“Each partial detachment occurring during pregnancy, gives rise to the exposure of a greater or less number of vascular placental orifices, and consequently to a greater or less degree of hemorrhage from these orifices. Each of these hemorrhages generally ceases after a time, and the mechanism of their cessation is not so much to be found in any changes in the corresponding part of the uterus, as in the changes I have adverted to as occurring in the separated portion of the placenta. The blood becomes infiltrated and coagulated in the substance, and occasionally also upon the surface, of this separated portion; its vascular maternal cells are thus rendered impermeable; and the temporary arrestment of the flooding is consequently effected. The blood diffused and infiltrated into and upon the detached portion of the placental structure, undergoes a series of changes which I have elsewhere attempted to trace minutely; and, after a time, the separated and ecchymosed tissue of the placenta itself becomes yellowish and atrophied, partly from the alterations which occur in the blood infiltrated through it, and partly from the obliteration of its vessels, and the consequent degeneration and desiccation of its tissues. In cases of *placenta prævia*, in which there has been a repeated recurrence of hemorrhage, and as frequent an arrest of it, we can occasionally trace in the placenta, after its expulsion, different

parts of it, showing a series and gradation of pathological changes arising from successive partial detachments, and successive apoplectic infiltrations and obliterations of its substance from coagulated blood of different ages lodged in its structures. These alterations are confined to the detached portion, and the part always presenting the most recent stage of the pathological changes in question, is that lying nearest the line of junction, between the separated and affixed division of the organ. The part showing the most advanced stage of the changes, will be found situated furthest from this point; or is, in other terms, the part which was first and earliest detached. In cases of direct and central implantation of the placenta over the os, the centre of the organ having in general become first detached, will be found to present the oldest morbid alterations; and the newer forms and phases of it may be sometimes traced in successive departments or layers, from this to the circumference of the detached portion, always supposing there has previously occurred a succession of detachments and attacks of hemorrhage. If the edge only of the placenta has presented, and several successive hemorrhages have in the same way taken place previously to labour, the same series of morbid changes will be found in the organ, running, not, as in the above instance, from the centre towards the circumference, but from the presenting or earliest separated point of the edge, more or less towards the centre of the mass.

“As affording some proof of the correctness of the view which I have already ventured to give of the immediate source of the discharge in unavoidable hemorrhage, I would beg to dwell for a moment on one other point. Almost all obstetric authors mention, as a mark of diagnosis during labour, between unavoidable and accidental hemorrhages, that in the first or unavoidable species, the flooding is greatest during the pains, and least during the intervals; whilst, in the last, or accidental form, the discharge is least during the pains, and greatest during the intervals. In placental presentations, ‘the character of the hemorrhage (says Dr. Rigby, p. 255, *System of Midwifery*) is also different from that of common hemorrhage, inasmuch as it increases during a pain, and diminishes or ceases during the intervals, whereas in hemorrhage under ordinary

circumstances it is the reverse.' I am not aware that any solution has been hitherto attempted of this peculiarity in unavoidable hemorrhage. And, whilst it seems very inexplicable upon the idea generally received that the discharge comes from the exposed surface of the uterus, it is a condition which we might have *à priori* anticipated from the opposite opinion, that the effusion flows from the detached surface of the placenta. For, if in *placenta prævia* the hemorrhage proceeded from the vascular orifices laid open on the interior of the uterus, it ought to be diminished and not increased in quantity during the pains, as these orifices will necessarily be temporarily diminished under the contraction of the uterine fibres. If we adopt, however, the other view, that the discharge proceeds from the open vascular orifices existing on the outer or maternal surface of the detached portion of placenta, we can easily understand how its amount should be temporarily augmented by each labour pain. For each uterine contraction, in pushing down the presenting part of the child against the compressible placental mass, will squeeze out from its maternal cells, as from a sponge, a portion of the fluid blood contained in them; and hence, during the pressure, an increased flow of this blood will issue from the vascular orifices opening upon its detached surface. During the intervals between the pains, a re-accumulation of maternal blood will take place in the interior of the placenta; but the quantity actually escaping will be comparatively less, till again it is forced out in accumulated amount by the compression to which it is subjected by a returning pain."

Such are the views of Dr. Simpson, ingeniously put and ably maintained. As applicable, in explanation of the reason why there is a total cessation of the hemorrhage in *placenta prævia* cases, after the complete detachment of the placenta, they would seem, if his premises are correct, to be conclusive, since, if the flooding comes only from the placental surface, and not from the internal surface of the uterus, it is not surprising that it should cease, when the placenta has been detached, because this body is then no longer supplied with blood from the mother. But is it true that the principal source of hemorrhage, in partial detachment of the placenta, is from the surface of this body, and not from that of the uterus?

We think not, because the blood-vessels, which actively transmit blood from the mother toward the placenta, would be much more apt to bleed, when ruptured, (as they must be when the placenta is detached,) than would the placental vessels, the current of whose circulation is directed towards the *fœtus*. That the latter may bleed some, cannot be doubted, but that the former bleed more, seems to us equally true.

However confirmatory these views of Dr. Simpson may be of the facts, connected with unavoidable hemorrhage, and however difficult it may be for us to explain them, upon other principles, still we must confess that they are at variance with our notions in regard to the anatomical structure of the placenta, and the connexion of this body with the internal surface of the uterus. Much less are we disposed to believe that, in other forms of hemorrhage, the same principles are applicable, and that a partial detachment of the placenta is more apt to give rise to serious hemorrhage, than its total separation. If this were so, then a complete separation of the placenta, even though the uterus were uncontracted, would be fraught with less danger than where a small portion only was detached. That a partial detachment may give rise to considerable hemorrhage, is perfectly true; but no case is fraught with more danger than that in which there is a complete separation, the uterus still remaining uncontracted. That this state of things may exist, without flooding, is true; but here the absence of hemorrhage is probably due to the existence of syncope, or a condition approaching it, during which the impulse of the heart is so feeble as not to drive the blood through the uterine vessels with sufficient force to break down the coagula, which soon form, (especially when the blood flows very slowly,) at the open mouths of these lacerated vessels.

In the case of twins, where the first child and its placenta are expelled, Dr. Simpson asks why it is that there is not flooding? We answer, that hemorrhage does take place frequently, and where it fails to occur, the flow of blood is doubtless arrested by a partial contraction of the uterus, and by the application of the remaining *fœtus* against the exposed surface of the uterus.

But our dissent from the explanation of Dr. Simpson, does not

necessarily imply a dissent from the plan of treatment he proposes. His treatment is based upon the positive fact that, in unavoidable hemorrhage, the complete separation of the placenta is usually followed by an arrest of the hemorrhage. But the best plan of testing the value of this new treatment, is to inquire whether its results have proved beneficial. It is stated that in unavoidable hemorrhage, treated by turning, the death of the mother occurs about once in every three cases; thus, in sixty-one cases occurring to Drs. Lee and Ramsbotham, twenty-four mothers perished—a mortality equal to that incident to the Cæsarean section, but according to Dr. Simpson's plan, only one female in fourteen is lost. As far as the life of the child is concerned, the old practice of effecting delivery by turning, certainly has advantages, since it is scarcely possible that the child can be born alive when the placenta has been completely detached for any length of time. If after the detachment of the placenta, the delivery of the child is speedily effected, it might be born in a viable condition; but the chances in this case would be decidedly unfavourable to so favourable a termination. It may then be assumed as settled, that inasmuch as the hemorrhage is usually arrested as soon as the placenta is completely detached, the mortality, in Dr. Simpson's mode of treatment, is much less, as far as the mother is concerned, than where turning has been resorted to; but that, in the former case, the death of the child is almost certain, whereas in the latter, there exists some chance of its being born in a viable condition. The question then is this, is it better to resort to *an operation* which saves one child in four, but allows the sacrifice of one mother in three, or to *one* by which every child is lost, but by which only one mother in fourteen perishes? That the life of the mother is infinitely more important than that of the child, is a question which has long been settled by American and British midwives; hence we do not hesitate to advise the adoption of that plan of treatment, which can best insure the safety of the mother, even at the sacrifice of the child.

But Dr. Simpson himself does not seem so wedded to his own views, as to recommend, under all circumstances, the adoption of a practice so fatal to the life of the child, since he admits there

are cases in which turning may be effected with comparative safety to both mother and child.

We may conclude our remarks upon this subject, already too much extended, by laying down the following general rules : 1st. That the plan proposed by Dr. Simpson, is most favourable to the life of the mother, but most injurious to that of the child. 2d. That this plan is applicable only "in severe cases of unavoidable hemorrhage, complicated with a rigid and undilated os uteri, in which turning would be impossible or hazardous; in most primiparæ; in unavoidable hemorrhage, with premature labour, and an undeveloped condition of the os and cervix; in placenta presentations, with distorted pelvis; in cases where the extreme exhaustion of the patient forbids turning, and where the fœtus is ascertained to be dead, or is premature and not viable." 3d. That in ordinary cases of unavoidable hemorrhage, turning may be relied upon.

In some cases the placenta only partially covers the circumference of the cervix uteri, and here its edges may be felt running into the fœtal membranes. In this case, if the hemorrhage be not severe, and if the os uteri be undilatable, it will be best to rupture the membranes, and excite the uterus to contraction. Where, however, the hemorrhage is great, and the os uteri dilated or dilatable, the hand must be insinuated into the uterus, and version effected.

b. Another form of hemorrhage, which may occur during the latter months of pregnancy, is termed "*accidental*," and is due to detachment of the placenta, occasioned by some accident, disease of the ovum, &c. &c.

This variety may be diagnosticated from unavoidable hemorrhage, by observing the following points : 1st. Its origin is not usually spontaneous. 2d. The amount discharged is arrested during uterine contractions. 3d. Examinations per vaginam will indicate the difference between the two cases.

Accidental hemorrhage may be concealed, that is to say, the blood not escaping from the uterus, the patient may expire suddenly, like one who perishes from the rupture of an aneurismal tumour. The symptoms indicating its existence, are those peculiar to excessive losses of blood. These cases are fortunately

rare, and when they do occur, but little can be done, except the use of stimulants, and probably transfusion. This kind of hemorrhage may occur under several conditions.

If hemorrhage occur before the commencement of labour, and before the rupture of the membranes, or the dilatation of the os uteri, we must resort to the employment of those means already laid down for the arrest of hemorrhage, and in this case the tampon may be employed with advantage. Should these remedies fail to stop the bleeding, it will become necessary to rupture the membranes, and evacuate the waters, which in most cases, will promote sufficient uterine contractions to arrest the hemorrhage. Though Guillemeau and Parè had recommended version in this form of hemorrhage, as well as in placenta prævia cases, yet it is to Mauriceau and Puzos that we owe the suggestion of the advantages derived from first rupturing the membranes, for the purpose of inducing uterine contractions. If this should fail in arresting the hemorrhage, and the condition of the patient's strength, and the state of the soft parts be favourable, we must turn and deliver in accordance with the rules to be laid down hereafter. Where these favourable conditions do not exist, we should endeavour to promote uterine contractions, by frictions of the abdomen, by the application of cold, and the use of the tampon.*

The existence or non-existence of labour, will not alter our management of these cases. Our treatment will ever depend upon the state of the soft parts; if they be rigid and contracted, we must temporise, but if they be relaxed, then either turning or the application of the forceps will be required.

Any one of the hemorrhages, which we have described, may be so abundant as to produce asphyxia and death. In cases where

* Lee says, "That in all cases of uterine hemorrhage, in the latter months of pregnancy and the first stage of labour, where the discharge is great, *the plug is inadmissible*;" he says, the better practice, even if the os uteri be rigid and undilated, will be to rupture the membranes and excite uterine contractions. Burns and others recommend the tampon in these cases, which it appears to us, is the most proper practice, and when this fails, the membranes may be ruptured.

asphyxia threatens from loss of blood, the following rules are laid down for our guidance.

1. If, in either early or late hemorrhage, the patient be in a state approaching asphyxia no manual interference is permissible, for a disturbance of the coagula by which the bleeding has been arrested, will produce its renewal with asphyxia and death.

2. In early flooding, death from loss of blood does not often occur; hence the necessity for manual interference will rarely be required, though at times it may be judiciously employed for the purpose of removing the contents of the uterus.

3. In later hemorrhages, if the strength of the patient permit, the cause of the bleeding must be detected, if possible, by an examination, *per vaginam*. If a placental presentation exist, version will become necessary, or where this is impracticable, we may resort to the treatment proposed by Dr. Simpson.

4. In later hemorrhages, where there is no placental presentations, the membranes should be ruptured as soon as the bleeding becomes dangerous. The rupture of the membranes, and the consequent discharge of the liquor, usually arrest the hemorrhage by bringing on uterine contraction. Should this fail, our conduct will be governed by the circumstances of the case. Where the soft parts are relaxed or dilated, either version or the use of the forceps will become necessary. But if these parts be rigid and contracted, we must temporise; contenting ourselves with the application of cold over the abdomen, the use of the tampon, &c.

5. We must, on no account, introduce the hand into the uterus, previous to the completion of the sixth month of pregnancy.

6. The hand must never be introduced into the uterus until the soft parts are dilatable, or the os uteri dilated to the size of half a crown. In these cases we must temporise.

3. We now come to the consideration of that form of hemorrhage which takes place between the birth of the child and that of the placenta. The flooding in this case, is due to a complete or partial detachment of the placenta, followed by a non-contracted condition of the uterus. This power of contraction is not peculiar to any variety of constitution, as is proved by the fact that in those females, whose constitutions have been debilitated by previous dis-

ease, the uterus is found to contract, in many cases, as well as in those persons who are in the enjoyment of robust health. It must be remembered, however, that the hemorrhagic tendency is stronger in some cases than in others.

Where the placenta, after the expulsion of the child, continues attached throughout its whole extent to the interior of the uterus, no hemorrhage can take place, and it is only when detached, either in whole or in part, by the previous contractions of the uterus, that bleeding can occur.

When the placenta is only *partially* detached, and the uterine contractions seem incapable of effecting its complete separation, the vessels already exposed, permit a greater or less hemorrhage. The amount of blood discharged in these cases, depends, according to most authors, upon the extent of surface exposed, and upon the degree of atony which pervades the uterus. The treatment under these circumstances, consists in rousing the uterus, by appropriate remedies, to a firm contraction of its fibres, the induction of which serves the double purpose of completely detaching the placenta and of arresting the hemorrhage, by a firm constriction of the open-mouthed vessels. But what are the means necessary for this purpose? *First*, constant frictions over the abdomen, in other words, kneading the uterus, will be found most serviceable; and when *patiently* persevered in, the globus uterinus will be found to harden under the hand. During the hardening of this uterine globe; coagula of blood will be discharged from the vagina, with some temporary increase in the hemorrhage; the occurrence of either of these circumstances need occasion no alarm in the mind of the practitioner, so long as the uterus continues hard and contracted. But we must not desist too soon in our frictions of the abdomen, since our object is not only to render the uterus contracted, *but to render it permanently so*. If upon discontinuing these frictions, we find that the hard and contracted uterus gradually becomes soft and expanded, our efforts should be renewed till the organ seems disposed to remain permanently contracted. This is a highly important point, for if the uterus be only temporarily contracted, and the practitioner leaves his patient, the flooding may be renewed and destroy life before his return.

2d. In addition to frictions, the application of cold over the abdomen, either by means of cloths dipped in cold water, or cold water poured upon the abdomen, exercises a powerful influence in bringing on uterine contractions. The employment of the *secale cornutum*, will also be found useful in these cases; it may be given in powder, or the wine of ergot may be used. The other astringents exercise but little influence in arresting this variety of hemorrhage, though after it has been principally arrested, we have employed, with benefit, the acetate of lead and opium.

3d. Of late years it has been proposed by Dr. Radford, to apply the galvanic current for the purpose of inducing uterine contraction. Dr. Radford's article upon this subject is so full of good sense, and the subject is, as yet, so novel to the profession, that we shall insert the whole of it into our pages:

“*Uterine* hemorrhage is usually divided into that which takes place in the early months, and that which takes place in the latter months of gestation. The latter class is again subdivided into what are called accidental hemorrhages, unavoidable hemorrhages, and the after hemorrhages. Accidental hemorrhages are those which arise from accidental causes; unavoidable hemorrhages are those which arise from a particular location of the placenta in the immediate neighbourhood of the os uteri; and the after hemorrhages are those which take place after the delivery of the child, and they may occur either before or after the expulsion of the placenta. You will be also aware that there are a number of other uterine hemorrhages which are unconnected with gravidity; but it is my object in this lecture more particularly to dwell upon those discharges of blood which are connected with pregnancy in the latter months, and with labour. It is not my intention, on the present occasion, to enter into a full consideration of the subject, but more particularly to confine my remarks to that condition which is the result of profuse and long-continued bleeding, viz., exhaustion, a state highly interesting to the obstetrician, and which seems to me to require more than the recognised means for its management.

“Now, we know that exhaustion may arise in all the varieties of hemorrhage; but we find that it is more especially produced by

those impetuous and large discharges of blood which take place before, during, and after labour.

“With regard to those cases of flooding, before and during labour, which have proceeded to a state of exhaustion, it has been the custom of many obstetrical writers to recommend the practice of delivery. Others have discountenanced delivery in this particular condition; and of course, where the principles of practice are unsettled in a case so important, it is very desirable that we should endeavour to discover some new method of treatment which shall place the question beyond dispute. Although such high authorities as Burns and Hamilton advocate delivery in these cases, it has always been my practice to recommend non-delivery; and if we were to analyse the cases that have been published in the reports of hospital and private practice, and those that have accidentally come to our knowledge, we should be startled at the immense loss of life arising from these extreme cases of hemorrhage, where delivery has been adopted.

“Now, I regret to say, I believe that the great ruling influence upon the mind of practitioners, in determining them to deliver at all hazards in these cases, is the dread of popular opinion. It is usually stated that no woman ought to die undelivered; and where a woman does die undelivered, it produces a very considerable sensation, both in the neighbourhood and in the mind of every party who may come to a knowledge of the circumstances. On this account a practitioner dreads the procrastination of delivery, lest death should occur before it can be accomplished, and his character consequently involved in censure. Now it appears to me, that when a practitioner is thus placed, he ought to possess sufficient moral courage to resist the pressure of popular opinion, and be guided by a higher principle in the discharge of his duty; and I am convinced that if the matter is fairly and dispassionately considered, it will be found there is a great advantage in not delivering in these cases of exhaustion.

“And first, with regard to the child, it is stated by the advocates for delivery, that there is the greater probability of its being saved by the immediate adoption of this operation, than by its delay. But if we take the pains to investigate the reports that have been published, as well as to examine into the results of the practice of private

individuals, it will be found that the child is nearly always dead in these extreme cases. Therefore this consideration ought not to have much weight with us in deciding upon the principle of practice. And if we reflect upon the causes which give rise to hemorrhage, more especially in placenta prævia, we shall find sufficient reasons for understanding why the child should be generally dead. In the accidental species of hemorrhage, if the cause has been such as not only to lead to a separation of the placenta, but to something like a disruption or a wounded state of that organ, the death of the child is nearly inevitable; and in the unavoidable species, from the particular location of the placenta, if we recollect what must be the influence of labour upon the placenta itself, not only in producing detachment and a separation of its connexion with the sides of the os uteri, but also the mechanical influence applied by the child's head coming upon it, we must see that in this case there is generally more or less of a disruption and breaking up of its structure; and consequently the child dies from bleeding from its own particular system.

“If we go into inquiries as to the influence of the death of the child upon the hemorrhage, we must look upon it as being rather an advantage to the mother, because it takes off a certain demand upon her blood, or lessens what Hunter calls ‘the stimulus of necessity,’ and therefore makes such a change in the balance of her circulation, as would be a means of checking, rather than increasing, the discharge.

“We will now proceed to consider the question as regards the life of the mother; and when we are contemplating a subject of this kind, a woman placed under extreme circumstances of inanition or exhaustion, we ought not to ask, ‘Ought a woman to be delivered?’ but ‘*Can* a woman be delivered *safely*?’ That is the question we ought to endeavour to settle in our minds before we proceed to the operation. If we have a woman already in a state of exhaustion from large evacuations of blood, we must be certain that a plan of treatment which, in any way, produces an unfavourable change upon the nervous and circulatory systems, must add to the evils already existing. We have here sufficient prostration; and the mere emptying of the uterus will most inevitably

increase it. Every surgeon is aware of the influence that is produced by the operation of tapping in cases of ascites in men strong in comparison of some of these poor women, reduced as they are by the loss of so large a quantity of blood. Syncope, nay, even death, is sometimes the result of the abstraction of the ascitic fluid. We know also in some cases, and especially where there is a particularly exalted state of the nervous system, or some particular idiosyncrasy, that simple evacuation of the uterus, by the natural efforts, will produce death! This very change then has in itself a very unfavourable influence upon a woman thus prostrated. But, besides this, we must bear in mind that there must necessarily be a great demand upon their powers by the stimulus of forcible delivery.

“There are a number of other circumstances which ought to be taken into account, as regards delivery; and one of the most important of these is the physical or structural impediment that may arise from a rigid os uteri. And when we come to the bedside of a patient, (I am sure every gentleman who has had much practical experience, will bear me out in this statement,) we shall find that some of those dogmas which are laid down in books are wholly untrue. I now refer particularly to that assertion of certain writers, who say, that by the evacuation of blood, the soft parts become so weakened and dilatable, that delivery can always be accomplished. This I most positively deny. And therefore I say that there are conditions of this kind which will be an obstacle to delivery.

“The os uteri will continue *undilatable*, although the woman may be in such a state of exhaustion as to be literally tottering on the brink of the grave! It is true that this state of matters does not generally exist, but it is too frequent to be overlooked in determining our line of practice.

“Again, we should be aware that hemorrhages take place, and produce this state of exhaustion, before the woman has progressed to that period of pregnancy that would justify a practitioner in having recourse to forcible delivery; and this is a point not sufficiently dwelt upon by obstetrical writers. In proportion to the early occurrence of hemorrhage, so will be the obstacles to delivery,

as regards the introduction of the hand into the uterus. And when we are considering the chances of delivery, and taking into account the dilatable state of the cervix and the os uteri, we should never forget the length of the former, as regards the particular period of pregnancy. And not only is this to be taken into account, but there is another circumstance which must not be overlooked, viz., the degree of subsidence of the uterus into the pelvis; for according as the uterus remains high in the pelvis, so we may be certain that the difficulties of delivery will be proportionate.

"In all uterine hemorrhages connected with pregnancy, there are certain attendant circumstances, viz., separation of the placenta, with or without disruption of its structure; exposure of the large orifices connected with the uterine sinuses, rupture of the decidual vessels, and atony of the uterus, which is either primary or secondary. The natural means for suppressing the discharge are the formation of coagulæ, and the contraction of the uterus. As to the adhesion of the placenta, when once separated, or the cicatrization of this organ when disrupted, the practitioner can place no reliance on them in checking the flooding.

"With respect to the coagulation of the blood, it may become influential in arresting slight discharges, but never ought to be depended upon in those profuse hemorrhages which we are now more particularly considering. The coagula which form in the vagina, and which are stated to be so important in the suppression of the bleeding, may become indirectly an evil instead of an advantage, by deterring the practitioner from making a proper investigation of the case, under the idea 'that the disturbance of these coagula is death.' In my opinion, the coagula which are more particularly to be depended upon, are those in the immediate neighbourhood of the venous orifices that have been exposed, and I repeat that these are of no avail in the more serious cases; and therefore we must solely trust for the suppression of these large discharges of blood to that most important agent, contraction of the uterus.

"The ordinary means of producing uterine contraction are so well known, that I need merely refer to them before the present audience. We have the bandage, friction applied briskly over the

uterus, grasping pressure, secale cornutum, the application of cold, and, in the after hemorrhages, the introduction of the hand into the uterine cavity. But all these means may fail in producing this desirable change, and will fail and do fail in the extreme cases.

“A fatal case having recently occurred in this town, [Manchester,] which produced a considerable sensation at the time, where delivery was adopted, contrary to the principles which I had always publicly inculcated in my lectures, I was led to investigate the arguments of those who advocate that practice, more closely than I had perhaps ever before done; and it struck me that we were deficient in a means on which we might always depend for inducing uterine contraction, and so placing the woman in such a state of safety, that the operation of delivery might be deferred. Whilst my mind was so much occupied upon this subject, I was consulted by my friend Dr. Goodwin, in a case of protracted labour, where the long forceps were required. The lady recovered well, with the exception of not being able to pass her urine. We administered all the usual remedies for a fortnight or more, using the catheter twice, sometimes three times a day, but without the least amendment. Upon Dr. Goodwin's suggestion, we decided upon the application of galvanism, which was undertaken by him, and the result was most gratifying, for the first application proved permanently successful. The decided efficacy of this plan in restoring the energy of the bladder, immediately led me to conclude that it was the very agent that I have already stated was a desideratum to insure uterine contraction in cases of severe flooding, attended with exhaustion. We have here a woman reduced by loss of blood, with an atonic state of the uterus, either primary or as the result of the discharge. Now, as the advocates of delivery (*vide* Burns and Hamilton) say that this proceeding gives the woman the only chance of living, because, so long as the uterus remains distended by its contents, and its parietes atonic, those large venous orifices which have been exposed by the separation of the placenta, are so situated, that the chances of further effusion of blood exist; it occurred to me that the application of galvanism would so effectually act upon the uterine tissue as to induce firm contraction of its fibres, and thereby at once lessen those large openings, and

bring the walls of the uterus into firm apposition with the body of the child, so as to entirely close them. This great object having been attained, we might safely procrastinate the delivery, and adopt such means as would tend to raise the vital powers of our patient, such as the administration of opium, stimulants, and support, and the performance of the important operation of transfusion. With the uterus in this favourable condition, our restorative means, and particularly transfusion, would be far more likely to be attended with successful results, than if the organ were distended and atonic; for in this case, the blood which is introduced into the system, either directly by transfusion, or indirectly by nourishment, produces no permanent benefit, because it is rapidly discharged again. Analogy further led me to believe that my conjectures would not prove unfounded, for galvanism is particularly impressive in its influence upon the muscles of recently-killed animals, and we know how strictly allied in action, if not in structure, the uterus is to muscle.

“I mentioned my views to a number of medical friends, who generally much approved of them; and I was soon enabled practically to prove their correctness, by being called in consultation to a case of frightful hemorrhage during labour, attended with extreme exhaustion, and where the os uteri was so rigid that the advocates of delivery could not possibly have carried their views into practice, without lacerating the os and cervix uteri. By this case I ascertained that galvanism produces an effective and powerful contraction of the uterus; and not only so as regards its tonic contraction, but it has also the power of energetically exciting alternate contraction when applied at intervals. I can tell you most seriously and most solemnly, that it produces these two important changes upon the uterus in such a degree as, in my previous reflections on the subject, I had no conception of. The alternate contraction excited by this agent is analogous to, and as powerful as, that which is observed in normal labour, and the tonic contraction is greater. I shall not relate cases in detail, because it would occupy too much time; but I may state that I applied galvanism in a case where the membranes were unruptured, and the uterus in a state of great inertia, and alternate con-

traction was immediately produced. Before this, the membranes were very flaccid; but as soon as the galvanic circle was completed, they became extremely tense, and protruded low down into the vagina; and this state of tension did not subside when the alternate contraction ceased, as is observed in some degree in normal labour; for although the galvanic conductors were removed, so great a degree of tonic contraction of the uterus had been induced, that this membranous bag could not collapse.

“I am thus satisfied, that by the application of this means, we can induce such a state of chronic contraction in the uterus, that in these extreme cases of exhaustion from hemorrhage, the woman may be placed in such a state of safety, that delivery may be postponed until a time arrives when it can be safely accomplished, and in the mean time we can have recourse to those measures which tend to raise the vital powers.

“I think it probable that it may also produce one of the other natural means of suppressing hemorrhage which I have already referred to, viz., coagulation of the blood; but this I have not yet positively ascertained by experiment, although I am led to conclude that such is the fact, from some remarks made by Dr. Apjohn, in the article *Galvanism*, in the *Cyclopædia of Practical Medicine*.

“In my previous remarks, gentlemen, I must be understood to refer to those cases of hemorrhage where the placenta is not placed over or near the os uteri; but I shall now proceed to speak of those cases in which uterine contraction has a tendency to increase the discharge, cases which are usually described as belonging to the class, unavoidable hemorrhage. In these cases, where the peculiar location of the placenta deprives us of the benefits that usually accrue from uterine contraction, and as it is the special influence of galvanism to produce this effect, it ought to be the object of the obstetrician so to modify his practice, as to place them within the range of this remedy. Before entering upon a description of the plan which I would recommend to be adopted in these cases, I shall first direct your attention to the practice of the older writers; and secondly, refer to the mode in which nature sometimes terminates them when left to herself. In looking over

the authorities from about 1612 to 1790, we find that they vary in their practice. Some recommend the removal of the placenta before the child; others advise the same course conditionally, that is, providing it is offering itself very largely or decidedly to the finger of the attendant; others again, say that where it cannot be pushed back, it should be brought away before the child. It must be understood that many of these writers had not a correct knowledge of the true anatomical condition of parts in cases of placenta prævia, and I do not think it requisite to enumerate their names, as it would be occupying too much of your valuable time. You will find that in some of these cases, where the placenta was brought away before the child, according to the statement of these writers, the latter was even born alive, and in most of them the hemorrhage was suppressed. And whilst on this subject, I may call your attention to a few cases of more recent occurrence, where this practice has been adopted. It happened to me in 1819, to have a case of placental presentation, where I detached the placenta, because it was hanging down so low into the vagina, that there was no chance of doing anything else; the hemorrhage was immediately suppressed, and the child expelled by the natural efforts. I am also indebted to my friend Mr. Jesse, who is present, for the details of a case in which he detached the placenta, and in which the hemorrhage thereupon subsided. It was the practice of the late Mr. Kinder Wood, of this hospital, in many of these cases, to detach and bring away the placenta, and afterwards to leave them to the operation of nature, or to extract the child by the feet, as the case demanded. A case also occurred to Mr. Wilson, of this town, who kindly related the circumstances to me; the placenta had been rudely brought away by the attendant, and Mr. Wilson found the patient in a state of exhaustion, with the child still in utero. He extracted the child a considerable time after the removal of the placenta. It has occurred to me, in my hospital practice, to find that the placenta had been brought down in mistake by the midwives in these cases, and this without causing an increase of the flooding.

“Smellie mentions cases in which the placenta was brought away, and where the hemorrhage subsided. In Dr. Collins's Reports of

the Dublin Lying-in Hospital, there is a case in which the placenta was brought away by the midwife the evening before the admission of the patient into the hospital, and the hemorrhage was thereby suppressed. Baudelocque relates a somewhat similar case. And now let us consider the method in which nature sometimes terminates labours where there exists placenta prævia ; and for this purpose I have, without any great pains, collected 36 cases, illustrative of her powers in separating and expelling the placenta before the child.

“ Giffard mentions one case ; Perfect, one case ; Smellie, four cases ; Chapman, one case ; Ramsbotham, sen., six cases ; Merriman, one case ; Hamilton, two cases ; Collins, one case ; Barlow, one case ; Dr. Robert Lee, two cases ; Gower, one case ; Millington, one case ; Bailey, one case ; Wood, three cases ; Lowe, one case ; Hunt, one case ; Wm. Lowe, three cases ; Dorrington, two cases ; and I have met with three cases of the same nature myself. Besides these, Mr. Jesse has related to me a case of placenta prævia, where the entire ovum was expelled ; Mr. James Kenworthy, a similar case ; and the late Dr. Rigby has published a case also. Now, the bulk of these cases, gentlemen, have been detailed without any specific practical object, and consequently are more valuable to my present purpose than if they had occurred to myself, and had been brought forward to serve my own particular views. You may refer to many of them yourselves ; and you will find in nearly all of them that the hemorrhage was suppressed immediately after the placenta was thrown off.

“ These cases, then, and the practice already referred to, as adopted by the older writers, and several modern obstetricians, appear to me to furnish data of a most important character, whereupon a practice, adapted to cases of exhaustion from unavoidable hemorrhage, may be based, in order to bring them within the sphere of the application of galvanism. And before entering upon a description of my proposed plan of managing these cases, I beg to remind you that it is an established fact, that partial separation of the placenta, whether in simple or in complicated retention of that organ after labour, or in placenta prævia, is attended with far more profuse bleeding than total separation.

“In the earlier part of the lecture, I stated that one means of adding to the exhaustion already existing, is the evacuation of the uterus, whether that evacuation be partial or entire; therefore I consider that in these cases of placental presentation, it would be a decidedly important point of practice to draw off the liquor amnii *gradually*, as the first step in the management of the case. For this purpose I have somewhat modified Mr. Holmes’s instrument for perforating the membranes, making the canula much larger, and having an oval aperture placed on each side near its open extremity. The entire instrument consists of a canula and trocar, which latter always lies concealed within the canula, by means of a spiral spring, except when pushed out by pressure on its button-like extremity. This trocar can be entirely withdrawn from the canula, so as to leave the latter free for the passage of fluid. Now I propose to pass this instrument through the placenta into the amniotic bag, and then remove the trocar, so that the liquor amnii may escape, a plan which I prefer to rupturing the membranes at the side of the placenta, because the water in the latter case would flow too rapidly, on account of the practitioner not being able to limit the size of the opening he might make; and also because, by the plan now recommended, the integrity of the membranes being preserved, the placenta is thereby maintained in a better position for acting as a tampon against the open venous apertures when the head comes to press upon it.

“In rupturing the membranes in the ordinary method, it is quite obvious that as the connexion between the membranes and placenta is broken, the latter is liable to fall down more or less into the vagina. Having thus drawn off the liquor amnii, the next step will be to introduce the hand into the vagina, then to pass the fingers to the edge of the placenta, and carrying them on between it and the os uteri, to sweep the hand round its whole circumference, so as completely to detach the placental mass, care being taken to avoid rupturing the membranes. We have now brought the case into such a state as to be within the influence of galvanism; for although this practice of detaching the placenta may be a means of suppressing the bleeding, yet it will not restore the depressed powers of the woman; and on that account we still re-

quire an agent to induce such a degree of uterine contraction as will secure her from all chances of further hemorrhage, while we have recourse to such measures as will tend to support her strength.

“In order, then, to insure uterine contraction, we must have recourse to galvanism, and the subsequent management of the case must be conducted on ordinary principles, such as supporting the woman by stimulants, nutritious articles of diet, and transfusion. The delivery should be deferred until the powers of the patient are so far rallied as to justify its being undertaken, however long the interval may be; and that mode adopted which makes the least demand upon her constitutional powers. It may happen that a repetition of the galvanic shocks may, after a certain period, induce such uterine action as will expel the whole of the contents of the organ; and if this should not happen, it appears to me that it would be the best practice, to apply the long forceps, having previously removed the placenta, that is if the head presents. If any other part of the child presents, the case must be managed on ordinary principles.

“The novelty of these views may produce an impression unfavourable to their proper estimation, but I hope, gentlemen, you will recollect that it has been my object to bring them before the profession in order that their correctness may be tested. I wish to benefit poor suffering women in their hour of danger, and to be candid in my communications to my professional brethren. In my own mind I am satisfied as to the influence of galvanism, and its power of producing uterine contraction. I am also convinced that it has no evil influence on the life of the child in utero, and after its birth that it is an important means of resuscitation in cases of asphyxia. Objections may be raised that we have not always the apparatus at hand. The answer to this objection is the same as that which refers to the application of all instrumental means. In my opinion, no gentleman who possesses the principles of a correct obstetrician, would carry his forceps, vectis, perforator, crotchet, or transfusion apparatus along with him. These things are to be sent for in emergencies only, and the same remark applies to the galvanic apparatus.

“My remarks have hitherto been confined to the treatment of

those cases of hemorrhage that are attended with exhaustion before delivery, but there are other cases to which galvanism is equally applicable. If we investigate the cases given by authors, we shall find that there are many cases of accidental hemorrhage before delivery, where artificial rupture of the membranes has not succeeded in arresting the discharge, on which account several writers, Burns and Hamilton amongst them, advocate delivery in preference to this operation. Now, the artificial rupture of the membranes is recommended for adoption without reference to the condition of the os uteri; and it must be obvious, if this part is rigid and undilatable, and the flooding should continue although the membranes have been ruptured, that it would be highly hazardous to introduce the hand and to deliver by force. In such a case galvanism would place the woman in a state of security, by exciting the contraction of the uterus. I also consider that this power would be useful in some of the hemorrhages of the early months of pregnancy.

“With regard to the after hemorrhages, especially those attended by exhaustion, I consider it particularly applicable where atony of the uterus is the principal feature of the accident. In those cases which occur previous to the expulsion of the placenta, it would be the duty of the practitioner to assure himself that this mass was not morbidly adherent to the sides of the uterus.

“In hour-glass contraction, and other forms of irregular uterine action after labour, I anticipate great benefit from its use. In these cases there is a loss of balance between the contractile power of different parts of the uterine fibre, one part being in a state of atony, whilst the other is in a state of firm contraction. Now, if the galvanic current be directed in the longitudinal axis of the organ, it strikes me that you might excite the longitudinal fibres to contraction, and thereby restore the balance.

“There are several other topics not directly connected with the subject of this evening’s lecture which I shall slightly notice, in reference to galvanism. I am satisfied from positive trial of the remedy, that it will be found a most important agent in tedious labour, depending upon want of power in the uterus, and where no mechanical obstacle exists. I would also suggest the probability

of its proving valuable in originating uterine action *de novo*, in cases where it may be considered necessary to induce premature labour. It seems to me also to be worthy of trial in certain cases of menorrhagia in the ungravid state, where, on vaginal examination, the uterus is found to be atonic, as evidenced by its large flaccid condition, and the patulous state of the os uteri.

“ Having made this digression, it is proper that I should remark, in reference to cases of hemorrhage, that I am not urging this plan of treatment upon the profession, with the view of superseding the ordinary means, but rather with the view of supplying a remedy in those extreme cases where these have failed. I do unhesitatingly say that the obstetrician has the power in most cases to control uterine hemorrhage, so as to prevent them ever reaching this extreme state of exhaustion. But, nevertheless, we do meet with this condition frequently in a large hospital practice, and also in private consultation practice. A number of cases have come to my knowledge within a very few months, where death has resulted from this excessive exhaustion. I therefore say that we ought to have some more certain means than delivery to depend upon in these cases; for, if this expedient be so important a means of saving life, how is it that it so often fails?

“ With regard to the mode of applying galvanism in these cases, I have used an electro-magnetic apparatus, contrived by Messrs. Abraham and Dancer, of this town, for medical and other purposes. It consists of a battery in a small jar, and a helix with conductors. For the sake of convenience, the latter are connected with the helix by means of long wires covered with an isolating material. The strength of the shock is regulated by a small contrivance situated on the stand of the helix, by means of which it can be either diminished or increased. One of the conductors, which is applied externally, has a hollow wooden handle, through which passes the wire before alluded to, in order to join a brass stem terminating at its extremity in a ball. The other conductor, which is contrived by myself, consists of a strong brass stem, seven inches long, curved to suit the vagina, and covered with a non-conducting material, having a small screw at its distal extremity for attaching it to a silver ball; at its other extremity it is

received within an ebony handle, which is hollow, and through which passes a strong brass wire, looped at the end, and connected with the long wires before alluded to. This wire is kept disconnected from the brass stem by means of a spiral spring concealed within the ebony handle. The loop is covered with silk, and is intended for the thumb of the operator, when he is bringing the wire into connexion with the stem.

“When the remedy is applied, the brass ball of the vaginal conductor is to be passed up to the os uteri, and moved about at intervals, on to various parts of this organ. At the same time the other conductor must be applied to the abdominal parietes over the fundus uteri. Shocks may be also passed transversely through the uterus by simultaneously applying the conductor on each side of the belly.

“The application should be used at intervals, so as to approximate in its effects as nearly as possible to the natural pains. It may be continued until it meets the exigencies of the case.”

4th. If the remedies now recommended should fail in inducing uterine contraction, the hand must be introduced into the cavity of the uterus, and the placenta detached; nor when this is done, should we withdraw the hand until the uterus is found to contract firmly.

5th. After the entire detachment of the placenta, the flooding will cease, provided the uterus remains contracted. If the uterus does not contract, it should be made to do so by a resort to the means already alluded to.

b. The placenta may be partially separated, while its undetached portion remains morbidly adherent. This case may or may not be accompanied with uterine contractions, though these may be insufficient in effecting the complete detachment of the placenta. Where contraction exists, the hemorrhage of course will be less than under opposite circumstances. This morbidly adherent placenta is not of common occurrence, at least in this country, but where it does occur, we should endeavour to effect the detachment by exciting uterine contractions, and by traction upon the cord; where these fail, the hand must be introduced into the uterus, the placenta taken away, if it can be effected without injury to the

uterus, but no undue force should be used, and we must rest satisfied with the removal of the detached portion, leaving the separation of the morbidly adherent portion to the efforts of nature, &c. After having failed to detach the placenta, the hemorrhage, if it persist, should be moderated by the employment of the means to which we have already referred.

c. But the placenta may be completely detached but not expelled, owing to the subsidence of the uterine contractions. This subsidence of the uterine pains usually follows long-protracted labours, by which the forces of the female have been worn down ; or too rapid deliveries, either naturally so, or rendered so by " meddlesome midwifery," in which case the uterus is thrown into a state which Leroux termed " syncope;" or the subsidence of uterine contractions may occur independent of any of these causes. In such cases our treatment will consist in the use of those means which are capable of exciting contractions of the uterus, in the elevation of the pelvis, in counter-irritants, &c. The tampon should never be employed after the expulsion of the child from the uterus ; this is an invariable rule never to be forgotten.

But in these cases ought we to extract the placenta ? This will depend upon circumstances. Where the hemorrhage is not very great, and where the patient's strength is still good, the placenta should be removed, provided the uterus shows a disposition to contract ; but if the loss of blood has been so great as to produce partial or complete syncope, the placenta should not be extracted until the strength of the patient has been somewhat revived, and until the uterus begins to contract, because during this state of partial or complete syncope, the flow of blood is almost entirely arrested, a condition of the system exceedingly favourable to the formation of coagula, and consequently to the arrest of the hemorrhage. Our course here would be to revive, by means of general stimulants, the exhausted vital forces, and to excite by the use of those means so often alluded to, the contraction of the uterus. If we should remove the placenta before this is done, we only increase the danger by disturbing the existing coagula which, for the time, constitute the safeguard of the patient. Let it be remembered then that the proper plan in these cases, is first to excite the uterus to

contraction, and when this is done, we may without fear remove the placenta.

The management of the placenta, from irregular contraction of the organ, has been treated of in the chapter upon delivery of the placenta.

4. Hemorrhage after the expulsion of the placenta may be either concealed or apparent, and in either case it is due to a non-contracted condition of the uterus. After the delivery of the placenta, no one should neglect to examine into the condition of the uterus to see whether it be contracted or not. In a previous chapter on labour, we have accurately laid down the conditions of the uterus, which are to be regarded as favourable to the well-being of the mother, as well as those which are unfavourable, and to this chapter we would refer the reader. The treatment in this fourth variety of flooding is less complicated than where the placenta is retained in a detached or undetached condition, and consists in the persevering employment of those means which are capable of inducing a properly contracted condition of the uterus, &c.

In those cases where we have reason to apprehend that there will be flooding, Dr. Dewees recommends us "to take off the distension of the uterus as gradually as possible by the early evacuation of the waters; to diminish the force of the circulation by making the woman preserve a horizontal position, when the pains are urgent, by interdicting stimuli, &c., &c.," for, says he, "if we break the membranes while labour is active, the uterus would diminish in size in proportion to the water displaced, and would apply itself to the whole surface of the child, the inequality of which would serve as an important and healthy stimulus, and excite it to more certain contraction." This would explain the frequency of flooding in those cases where the membranes are left to be ruptured by the efforts of nature, and the rareness of flooding where they have been ruptured while the labour was active.

CHAPTER XV.

Deformity of the Pelvis.—In a previous chapter we described the form and capacity of the normal skeleton pelvis, and it will now be necessary to examine the deformities to which the pelvis is frequently liable. Every slight deviation from the natural pelvis does not necessarily imply difficulty or impossibility in extracting the full-grown fœtus, hence we should only regard as cases of pelvic deformity such deviations, as are calculated to interfere with the safe delivery of the fœtus at full term.

In some cases of deformity, the forceps may be required ; in others, premature delivery ; in others, perforation ; and in others, the Cesarean section. The degree of contraction, which demands either of these operations, will be explained hereafter, it being our present purpose, to present a general outline of the causes and nature of the different contractions to which the pelvis is liable.*

Causes.—These may be referred to three classes: 1st. Rickets. 2d. Mollities Ossium. 3d. Arrest of developement. In addition to these, there are some occasional causes which may produce pelvic deformity, such as luxations of the femur, amputation of one thigh, fractures of the pelvic bones, exostoses, &c.

* When the pelvis measures from three and a half to four inches in its small diameter, the labour may be accomplished without difficulty, provided there be no abnormal size of the fœtal head. If this diameter measure from three to three and a half inches, the forceps will be required. But if the length of the small diameter be reduced to two inches and a half, or ever so little below two and three quarter inches, premature delivery may be tried, and should the head be unable to pass, the perforator must be used. The operation with the perforator will be rendered impracticable, where the small diameter is reduced to one inch and a half, and here the Cesarean section is our last resource. This is the general rule, but for their more special application, we would refer to the chapters on these different operations.

In some cases, as in the abnormally large pelvis, or the dwarfish pelvis, it is impossible to detect the origin of the deformity.

Pressed upon by the weight of the upper part of the body *above*, and the resistance of the acetabula *below*, it is easily understood how the pelvis becomes deformed, especially if its bones be softened by disease, or unequally pressed upon, even where disease does not exist. In early life, it is well known that the bones have not attained the firmness which they acquire in the adult, hence it is that, in children, (especially those illy nourished and unhealthy) who are accustomed to carry heavy burdens, or to remain long in one position, the pelvis is exceedingly liable to become changed in capacity and form. Maygrier says, "the most common causes of the deformity or malformation of the pelvis, generally act with a certain degree of intensity, only during the early periods of life. Scrofula, so common among those nations who live in the temperate parts of Europe, may be considered as the most common and most general cause. The symptoms attendant upon the first dentition in young girls of the higher class of life in large cities, the ignorance and forgetfulness of the laws of Hygeia in the working and indigent classes, add singularly to the cause first mentioned; hence why labours are generally less difficult among females who reside in the country than in those of cities; the latter require the resources of art more frequently." In our own country, these causes are not as yet, so active agents in producing pelvic deformity, but when the density of our population becomes extreme—when poverty with all its attendant miseries, blights the happiness of our people, as it now does that of Europe, the same results will be inevitable, unless proper hygienic means are instituted by those in authority.

Rickets.—This is a common cause of pelvic malformation, and in persons affected with this disease, the bones are very much softened, owing to the absorption of the calcareous substances which always exist in a certain proportion in healthy bone. Rickets is a disease occurring principally during early life, and is usually more or less connected with a scrofulous taint of constitution. As this disease rarely attacks adults, it is not surprising, that most usually an arrest of developement of the pelvis, is connected with

the deformity consequent upon the softened condition of the bones. This point has been established by the researches of Guérin, and it is also asserted by this writer, that the want of proper development diminishes, as we progress from the legs upward, that is to say, the arrest is most apparent in the bones of the leg, less so in those of the thigh, &c., &c. If these views be correct, it is easily comprehended how, even after the cure of rickets not of long standing, excessive deformity may still exist.

The student must bear in mind, then, that in a majority of cases of rickets, we have to contend with a deformity incident, 1st, to the disease, 2d, to an arrest of developement.

It must not be supposed, that in every case of rickets there necessarily exists a malformation of the pelvis, nor is every deviation in the vertebral column, to be regarded as connected with this disease of the bones, since it is sometimes dependent upon muscular weakness.

Mollities Ossium or *Malacosteon*, like rickets, consists in an undue softening of the osseous texture. It most usually attacks persons over the age of puberty, and induces more extreme deformity, than usually follows the rickets of young people. Rigby says, this disease "seldom attacks women who have had no children, sometimes it begins shortly after delivery, and frequently during pregnancy, during the progress of which, it continues to increase. Hence it occasionally happens, that a woman has given birth to several healthy living children without any unusual difficulty in her labours, and where, after this, the pelvis has gradually become so deformed from the mollities ossium as to render delivery impossible by the natural passages." This disease seems to be connected with a gouty or rheumatic diathesis; its progress towards excessive deformity is very gradual, and the student must be cautious in supposing, that because a female has once given birth to a full-grown child without difficulty, she will do so in the succeeding labours.

Dr. Barlow says "that eight cases of this species of progressive deformity have fallen under my notice, in one of which the projection of the last lumbar vertebra at its union with the angle of the sacrum, was so much bent forwards into the cavity of the pelvis,

that on the introduction of the forefinger up the vagina, a protuberance was presented to the touch, very much resembling the head of the fœtus, pretty far advanced into its cavity. On carrying the finger a little anteriorly past the projection, I could with difficulty ascertain the head of the child : but on moving it around, the distortion appeared so great, that the whole circumference did not exceed that of half a crown piece. This occurrence was on the 29th of April, 1792, at which time, I delivered the woman with the crotchet, and the bones of the pelvis receded considerably to the impulsive efforts during the extraction of the head of the fœtus ; yet, notwithstanding the flexibility of the bones of the pelvis, and the debilitated state of her constitution, she recovered speedily, and without interruption." On the 2d of February, 1794, Dr. Barlow says, " I found her unable to walk without assistance, and as she sat, her breast and knees were almost in contact with each other. The superior aperture was nearly in the same state as when I delivered her with the crotchet, but the outlet appeared more contracted, the rami of the pubes overreached, leaving a small opening under the symphysis, barely sufficient to admit the finger to pass into the vagina by that passage, and another aperture below, but rather larger, and parallel with the junction of the tuberosities of the ossa ischii. From what I learned afterwards, respecting this decrepit female, she survived this period about two years, at which time she had become still more distorted in the spine ; and after her death, it was with difficulty she could be put in her coffin ; this woman bore nine children, and died in the thirty-ninth year of her age."

. Now, in either rickets or mollities ossium, the mode in which the pelvis becomes deformed is essentially the same. Thus the weight of the body above, pressing upon the sacrum, already softened by disease, will tend to force it out of its natural position, producing an alteration of the capacity of the pelvis, either at the brim or outlet or excavation ; or the acetabula may be driven inwards, involving a diminution of the oblique diameter of the pelvis, and also, in extreme cases, of the antero-posterior diameter. In some cases of luxation of the femur, the pressure may be in

the direction of the transverse diameter of the pelvis, when a diminution of its length will be the result.

These various forms of deviation may exist singly, or they may all be combined.

Arrest of Development.—In this case the pelvis of the child, which is narrow and contracted, fails to undergo that simultaneous change which all the organs of generation undergo at the approach and consummation of puberty,—in other words, the pelvis, instead of being converted into that of a well-developed female, retains its *infantile* condition, and is thus rendered incapable of allowing the passage of a full-grown fœtus. This arrest of development, as has already been stated, is connected most usually with rickets, but not with mollities ossium. In other cases, a partial arrest takes place, giving rise to the variety of pelvic deformity so accurately described by Nægelè, and termed the *obliquely oval pelvis*.

The dwarfish pelvis, of which we shall speak presently, is not due to a want of development, as has been supposed by many authors, since it resembles, in every point of view but capacity, the pelvis of a well-formed female.

Occasional Causes of Pelvic Deformities.—Besides the pelvic contraction arising from diseased bones, the same result may take place in consequence of congenital or accidental luxation of the femoral bones. In this case, unless reduction be soon effected, the accident becomes permanent; a new joint is formed upon some portion of the external surface of the os innominatum, which may not be so capable as the acetabulum, of resisting the weight of the body against the head of the femoral bone, and a consequence of this will be, the compression inward of some part of the bones, forming the periphery of the pelvic excavation. The effect of luxation is most observable where the accident has occurred to young persons, or those in ill health.

The character of the deformity, in these cases, will depend upon the nature of the luxation, and may involve either the upper or lower pelvis. If the luxation only exists on one side, the compression of the pelvis will be confined to one side; if, however, the luxation be double, and of the same nature, the patient, in order

to give a firm point of support to the head of the femoral bones, walks with the legs widely separated, and the compression of the sides of the pelvis becomes almost inevitable. If the luxation be upward and backward, the upper pelvis will be the seat of the contraction; but where the displacement is downward, it is plain that the capacity of the excavation may be involved.

In the case of a double luxation, upward and backward, there may be connected with a contraction of the transverse diameter of the brim, an elongation of the transverse diameter of the inferior strait, with a diminution of its antero-posterior diameter. This result is explained by M. Sedillot as follows: persons afflicted with a double luxation usually, as we have already stated, walk with the legs widely separated, in consequence of which the small muscles, which have their origin at the tuberosity of the ischium, and are inserted into the upper part of the femoral bone, are put upon the stretch, and gradually draw out the tuber ischii, so as to enlarge the bis-ischiatic diameter of the inferior strait; but as the tuber ischii is drawn outward, the sacro-sciatic ligaments are rendered so tense as to draw the coccyx, &c., forward, so as to diminish the antero-posterior diameter.

If the luxation be single, and accompanied with shortening, the whole weight of the body will be thrown upon the non-luxated bone, and in this case the compression of the pelvic bones inward, will be confined to the sound side.

Again, it has been observed that in persons who have undergone amputation of the thigh, a deformity of the pelvis is very apt to occur. In this case, the whole weight of the body presses upon the sound limb, and necessarily, in progress of time, produces a compression inward, to a greater or less extent, of the pelvic bones. This result is more apt to occur when the pelvic bones are softened by disease, or where the accident occurs in very young persons.

Badly united fractures of the bones of the pelvis, exostosis of these bones, and other kind of pelvic tumours, occasion a diminution in the capacity of the pelvis. The extent of this diminution will depend upon the size and position of the tumour.

Deformities of the pelvis may be classified as follows: 1st, the

abnormally large pelvis, 2d, the *dwarfish pelvis*, 3d, the *unequally contracted pelvis*, 4th, the *obliquely distorted pelvis*, as described by Nægelè.

1st. *The abnormally large pelvis* may give rise to serious accidents, the most of which may, however, be prevented by the judicious management of the accoucheur. This excess in the size of the pelvis is sometimes connected with an undue developement of the whole osseous system; in the majority of cases, however, this excess in size is confined to the bones of the pelvis. Though Mad. Lachapelle and others have called in question the inconveniences resulting from this variety of deformity, still there can be no doubt that where the excess is great, there will be danger of too rapid delivery, of displacements of the uterus, and, *during pregnancy*, the enlarged organ may, by sinking into the excavation, occasion injurious pressure upon the bladder, rectum, &c. Any one of these accidents may be overcome by restricting the patient to the recumbent position during delivery and the first months of pregnancy.

2d. The pelvis, though of the natural shape, may be so small as to give rise to great difficulty in the delivery of the full-grown fœtus. This variety of deformity constitutes the "*dwarfish pelvis*," "*the equally contracted pelvis*," or the "*pelvis simpliciter justo minor*" of different authors. This kind of deformity is not very common in this country, and its diminution in size is not necessarily connected with a diminution in stature. Out of four cases reported by Nægelè, one female was dwarfish, while the other three had attained the usual developement of body. M. Dubois relates the case of a dwarf, aged 23 years, three feet two inches in height, in whom the pelvis was excessively contracted. The mother of this person was of the natural size, but the father was only three feet six inches high. Out of six children in this family, only three were dwarfish; hence it follows that dwarfs do not necessarily produce dwarfs.

The dwarfish pelvis is usually unconnected with rickets or malacosteon, for though each of its diameters is much diminished, still the individual pelvic bones are well formed, and the whole pelvis bears no analogy to the undeveloped pelvis of the child.

The contraction, in these cases, varies in degree, being sometimes not more than a quarter of an inch too small in every direction, or it may reach, according to Nægclè, as much as a whole inch.

The cause of this deformity is not well understood. By some, it has been attributed to an arrest of developement, but this cannot be, since the pelvis rarely, if ever, resembles the undeveloped pelvis of the child. Nægclè reports the case of a dwarf, twenty-one years old, well formed, but not able to walk, and idiotic. The pelvis resembled that of a child, the bones being still separated into their original pieces. The genital organs had also undergone an arrest of developement, which unfitted them for the function of reproduction. This was undoubtedly a case of arrested developement, but it was not an instance of the dwarfish pelvis, for the bones are stated to have been undeveloped, which is not the case in the equally contracted pelvis. This dwarfish pelvis occasions very great difficulties in delivery, since all of its diameters are equally contracted, and no advantage can be gained, as in the unequally contracted pelvis, by bringing the long diameter of the head into correspondence with the long and uncontracted diameter of the pelvis; hence it is, that most of these labours have resulted fatally to both mother and child.

This condition of the pelvis cannot be known beforehand unless the size of the patient or a previous labour should preindicate its existence. If our suspicions of such deformity should be excited, they may be confirmed by an examination.

4th. The unequally contracted pelvis, or the pelvis "*inæqualiter justo minor*," is usually due to disease of the bones, or to their undue pressure during infancy. The form which the pelvis in these cases assumes, may be arranged under three heads: 1st. Where the pelvis is contracted in its antero-posterior direction. 2d. Where the contraction involves the transverse diameter. 3d. Where the compressing force has acted upon the lateral and anterior portion of the pelvis, involving the oblique diameter.

a. Where the Pelvis is compressed or flattened in its antero-posterior direction.—In this variety of deformity, an excessive curvature of the sacrum may cause such a projection of its promontory as to diminish more or less the antero-posterior diameter

of the pelvic brim, without affecting the capacity of the excavation or outlet. In other cases, the sacrum may not be sufficiently concave, when deformity of the excavation will result, without necessarily involving a deficiency at the superior or inferior strait. Or it may happen, that while the base of the sacrum is pushed inward, its apex may be carried backward, occasioning contraction of the brim in the antero-posterior direction, but an elongation of the same diameter at the outlet.

By an increased curvature of the sacrum, the antero-posterior diameter of both brim and outlet may be contracted, while the capacity of the excavation undergoes an increase, or at least is not diminished.

The compression of the pelvis in an antero-posterior direction, is generally, though not always, caused by a displacement of the sacrum, since it may happen that, in addition to the jutting inward of the sacrum, the same position may be assumed by the symphysis pubis, giving rise to that form of the pelvis resembling the figure 8.

Too great length of the symphysis pubis, may give rise to a deviation from the normal pelvis, capable of retarding the delivery of the fœtus.

The antero-posterior diameter of the outlet may be diminished in length, by unnatural length of the coccyx; by its assuming a position too horizontal, or by an anchylosis of the sacro-coccygeal articulation. This last condition has been supposed to be the cause of tedious labours in those, who have not borne children till at an advanced period of life. That this *may be the case* is undoubted, but tedious labours, in those advanced in life, may be attributed with more propriety to the rigid and non-distensible condition of the soft parts.

b. Where one or both sides of the Pelvis are forced inward.—This is the rarest variety of contraction, at least as far as the diminution of the diameters of the brim and excavation are concerned. Those deformities which affect the inferior strait, are occasioned by an abnormal approximation of the tuberosities or spines of the ischiatic bones.

The form which the pelvic brim assumes under the influence of

this species of contraction varies with the extent, to which it has been carried. In some cases, where the transverse diameter is but little diminished, the pelvic brim is rendered more circular in shape; in other cases it assumes an oval shape, the long diameter of which, corresponds with the antero-posterior diameter of the pelvis.

Sometimes the contraction only exists on one side, when it will be found that the semi-circumference, along the contracted half of the pelvis, measures less than that on the other half. If, however, both sides are forced inward, the transverse diameter of the superior strait is diminished, but this diminution is not excessive, and is attended with an equal increase in the antero-posterior diameter of the same strait.

It rarely occurs that a contraction of the transverse diameter of the pelvic brim, is accompanied by an increase in that of the lower strait. This may occur, however, where a dislocation of the femur upward and backward has produced the contraction, and drawn the rami of the pubes, and the tuberosities of the ischia, more widely from each other. The mode in which this effect is produced, has already been explained. If the contraction be produced (independent of luxation) by improper pressure upon the pelvis, while the bones are softened by disease, the transverse diameter of the inferior strait, as well as of the brim, undergoes diminution.

c. Where the compression has acted by forcing inward the lateral anterior portion.—In this case the effect of the compression is felt upon the acetabula, and the oval shape of the pelvic brim is gradually converted into the figure of a club on a playing card. The contraction is not always so extreme, and frequently only consists in an interruption of the regular curvilinear form of the pelvic brim. If, however, the deformity should be extreme, the acetabula, unable to bear the weight imposed upon them, are forced inward, till not only is the oblique diameter greatly diminished, but owing to the close approximation of the horizontal rami of the pubes, the *available space* between the pubis and sacrum is destroyed.

In this variety of deformity, the effect of the contraction involves

the brim, outlet, and excavation ; hence this form of contraction is exceedingly unfavourable to the delivery of the child.

The diameters of the inferior strait, are often contracted by too great approximation of the tuberosities of the ischia, and inasmuch as this may take place independent of any disease, so also may it exist without alteration of the size of the pelvic brim. This form of contraction has been termed the *funnel-shaped pelvis*, and when it exists, the head may traverse with facility the brim and the excavation, and only becomes arrested in its progress, when it has arrived at the inferior strait.

4th. *The obliquely distorted Pelvis.*—This variety of deformity was first described by Nægelè, and the points connected with it are so interesting that we shall extract his resumé of the principal peculiarities of the obliquely distorted pelvis.*

“The peculiar characteristics of these deformed pelves are as follows :

“1st. Complete ankylosis of one of the sacro-iliac symphyses, or partial fusion of the sacrum and one of the iliac bones.

“2d. Arrest of developement, or defective developement of the lateral half of the sacrum, and defect in the amplitude of the anterior sacral foramina of the ankylosed portion.

“3d. On the same side, diminished length of the ilium, with diminution in the extent of the sciatic notches of this bone ; that is to say, the distance from the anterior superior spinous process of the ilium to its posterior superior spinous process, as also the length of a line drawn from a point at the pelvic inlet, corresponding with the sacro-iliac junction if it existed, along the linea innominata, and the linea ileo-pectinea to the symphysis pubis, are shorter than (the same distances) on the other side. But farther upon the ankylosed bone, the part corresponding with the articular surface, which is continuous without interruption, with the sacrum, is not so high, and descends to a shorter distance than it does on the opposite side, and than it would do in a bone normally formed ; or to express myself more clearly, if on the ankylosed side we

* The French translation from which we translate may be found in M. Cazeaux's work on Midwifery, page 470.

suppose the ilium and sacrum separated, or reunited only by the interposition of a fibro-cartilaginous disc, such as exists in the normal joint, the articular surface or the reunion of the two bones would be found less long, and would descend less low than it would on the non-anchylosed side, or upon the pelvis normally constituted.

“4th. The sacrum seems to be pushed towards the anchylosed side, and it is towards that side that its anterior face is more or less turned, whilst the symphysis pubis is pressed toward the opposite side, a disposition which prevents the symphysis pubis from being directly opposite the promontory of the sacrum, and gives it an oblique direction.

“5th. On the anchylosed side, as much of the internal surface of the ilium as concurs to the formation of the pelvic excavation is flattened, and where considerable vitiation exists, it is almost entirely plane, so that a line drawn from the middle or even from the posterior end of the linea innominata, along the body and the transverse branches of the pubis to its symphysis, will be nearly straight. We have never seen at the lateral half of the anterior wall of the pelvis, of which we now speak, any inclination inward, nor have we ever especially noticed that sort of fracture of the horizontal branch of the pubis, which is observed in pelves deformed from the effects of malacosteon in adults.

“6th. The other lateral half of the pelvis, that is to say, the one in which there exists a sacro-iliac synchondrosis, also differs from the normal condition. At first sight, in examining the pelvis under consideration, and especially where the obliquity is considerable, it is easy to induce oneself to believe in the normal conformation of the non-anchylosed half; but this opinion is not correct; thus, let us suppose two pelves equally contracted, with this difference only, that in one the *left* sacro-iliac symphysis is anchylosed, in the other, the anchylosis is on the right side; let a section of each be made so as to pass through the middle of the sacrum and the symphysis pubis;—if now we undertake to fit the right half of the first pelvis to the left half of the second, so that the cut surfaces shall cover each other, we will discover that the pubic bones are separated by a distance of from eight to twelve

lines. Thus the lateral half of the pelvis, which is free from ankylosis, participates not only in the abnormal situation and direction of the bones, but also in their irregular form, in such a way that in measuring this half, a line drawn from the centre of the promontory of the sacrum, along the linea innominata and pectinea, to the symphysis pubis, would be at its posterior half more curved, and at its anterior half less curved than in a pelvis well formed.

“7th. It follows from this, *a*. That the pelvis is obliquely contracted, that is to say in a direction which would intersect a line passing from the anchylosed joint to the cotyloid cavity of the opposite side, while the extent of the last-mentioned line is not diminished but may be increased where the obliquity is very marked. In consequence of this, the shape of the superior strait, (that is to say, an imaginary surface passing along the linea innominata and the linea pectinea over the sacrum,) and the shape of the middle of the excavation, (situated midway between the superior and inferior strait, called the *apertura pelvis media*,) would both resemble, properly speaking, an oblique oval when examined in front, the transverse or small diameter of which would be represented by the contracted oblique diameter of the pelvis, while its great or longitudinal diameter would correspond to the other oblique diameter. On this account we may, as far as the form is concerned, term this variety of pelvic deformity the *obliquely oval pelvis*.

“*b*. That the distance from the sacral promontory to the point corresponding to one or the other cotyloid cavity, (the distance sacro-cotyloid,) as well as the distance from the obtuse point of the sacrum to the spine of the ischium on either side, is less on the side where the ankylosis exists.

“*c*. The distance from the tuberosity of the ischium on the side of the ankylosis to the posterior superior spinous process of the ilium of the opposite side, as well as the distance between the spinous process of the last lumbar vertebra, and the anterior superior spinous process of the ilium on the side of the ankylosis, are smaller than the same measurements on the opposite side.

“*d*. The distance from the inferior edge of the symphysis pubis

to the posterior and superior spinous process of the ilium, when the ankylosis exists is greater than that extending from the same point of the symphysis pubis to the posterior superior spinous process of the opposite side.

“*e.* The walls of the pelvic excavation converge, in a certain oblique manner, from above downward, and the pubic arch is more or less contracted, so as to give it a resemblance to the male pelvis. These two conditions, as well as the contraction of the sciatic notch, the diminution of the distance existing between the spines of the ischium, and the one-sided and defective developement of the sacrum, bear a direct proportion with the degree of obliquity.

“*f.* Finally, on the flattened side, the cotyloid cavity is placed more directly in front than is observable in the normally formed pelvis, whilst on the opposite side, it looks almost directly outward, in such a way, that when examining the pelvis in front, the eye rests directly upon the cotyloid cavity of the flattened side, while the edge of the one, on the other side, can only be seen, or at least, very little of its cavity.

“In order to give to those who never have seen a pelvis of this kind, as accurate an idea as possible, we will remark that when first seen, they give us the impression that the deformity has been occasioned by a pressure acting from above downwards, and from without to within, in an oblique direction upon one of the lateral halves of the anterior pelvic walls, and upon one of the cotyloid cavities, while, at the same time, the other half seems to have been compressed on its posterior portion from without inward.

“Another peculiarity of this variety of deformed pelvis is, that they differ from each other only in the degree of their obliquity, and at the point where the sacrum is soldered to the ilium, whilst in every other respect, (that is to say, in reference to the principal peculiarities of the deformity), they resemble each other as much as two eggs. It is on this point that a skilful person, not knowing this peculiarity, would be disposed to take two different specimens, presented to his inspection for the same, and it would be difficult to convince him of his error, an example of which we will presently give.

“The condition of the bones of the pelvis (exclusive of the deviations already mentioned), as it regards their strength, their volume,

their texture, their colour, &c., is exactly similar to that of healthy bones, such as are observed in young persons exempt from all deformity. It is for this reason that we find on these bones, none of the signs, either as it regards form, etc., which are met with, as the consequence of rickets or malacosteon of adults. If we divest our mind of the existing deformities, the pelvis which we have seen, would seem to resemble, in general, the healthy pelvis. The majority of them belong to the medium-sized pelvis, while the others are either under or over the average size. In no case that we have specially noticed, have we discovered the least sign of the existence of rickets; in none, has there appeared any of the phenomena, or accidents, or morbid modifications, which usually precede or follow the English disease, or the mollities ossium after puberty. Nowhere have we been able to establish the injurious effects of external causes, such as falls, blows, &c., and never has there existed any antecedent pain. It has not been proved, in any of the cases which we have specially examined, that there existed any lameness. In one case only, we thought in seeing the person walk, we observed a slight limp, but other *connoisseurs* present at the examination, did not observe it, and the parents, and all the family of the person in question, assured us positively, that they had never remarked any lameness.

“In the pelvis of this kind, with the lumbar vertebræ attached, the vertebral column was straight in the lumbar region; in other cases, it inclined to the side exempt from ankylosis. In all the pelvises of our collection, provided with lumbar vertebræ, the anterior face of the bodies of the vertebræ was more or less turned towards the ankylosed side.”

The character of this deformity is constant, and seems nearly always due to an arrest of development of one or the other side of the sacrum. More frequent on the right than on the left side. The fusion of the ilium and sacrum at the sacro-iliac symphysis forms another peculiarity of this variety of deformity, though it is said by some not always to exist; usually, however, there is no remnant of the articulation, the two bones have the appearance of being fused into one. The ilium sometimes participates in the arrest of development.

Diagnosis.—It is highly important that the physician should

be able to detect the existence of pelvic deformity, and to diagnose with accuracy the extent of the malformation. Not only during pregnancy and labour is this knowledge of the state of the pelvis important, but it may become more so when the physician is called upon to decide whether unmarried females, in whom deformity of the pelvis is suspected, are capable of giving birth to a full-grown fœtus. In this case, if his knowledge of the means of forming a correct diagnosis is accurate and reliable, how vastly important do his services become, since upon his decision, *if unfavourable*, may depend the prevention of a marriage, the inevitable results of which would be the death of the female, or *if favourable*, he relieves the mind of the patient and her friends, and justifies the former in contracting an alliance, which when dictated by purity of feeling is the source of inestimable happiness to its possessors.

The means of diagnosis may be divided into the *rational* and *sensible*.

Rational signs.—In estimating the rational signs indicative of an alteration in the pelvis, the physician should bring to his assistance all the commemorative symptoms connected with the history of the case under examination. In view of this he should endeavour to ascertain whether there exists any scrofulous taint; whether the patient when a child found difficulty in walking; whether there exists any incurvation or shortening of the inferior extremities, and at what age these changes occurred; whether there is any deviation in the vertebral column, bearing in mind that this deviation is not always dependent upon rickets, and that sometimes it may exist without pelvic deformity; whether there is inequality in the length of the inferior extremities, and whether this be due to luxation or badly-united fractures, independent of rickets, or whether the inequality be the result of this latter affection of the bones or of mollities ossium.

Carefully informed on all these points, the physician will acquire much assistance in his future physical investigation of the pelvis.

As we have already mentioned, rickets is a disease of infancy, commencing about the first year, and rarely occurring after the period of puberty. In a large majority of cases it commences with the bones of the inferior extremities, gradually reaching those

of the pelvis, spinal column, &c. On the other hand, the vertebral column may be deformed without contraction of the pelvis; thus M. Bouvier states that in sixty-nine cases of spinal deformity, there were fifty-seven in which the pelvis and inferior extremities were naturally conformed, but in the remaining twelve cases there was deformity of the pelvis and inferior extremities.

Where the disease of the bones affects the vertebræ, a deformity of the pelvis almost always exists, while on the other hand the inferior extremities may be incurvated without necessarily involving a contraction of the pelvis.

From these facts the following approximative rule of diagnosis may be laid down: where the inferior extremities are unusually short, or unequal in length, or softened by disease, the pelvis, in a large majority of cases, has undergone some deviation in form and capacity. Again, in cases of spinal deformity, unaccompanied with any affection of the inferior extremities, the pelvis usually remains unchanged.

If the female be short and the arms long, when compared with the rest of the body, the chin projecting, the legs short and crooked, some deformity of the pelvis may be suspected.

Sensible signs.—The size of the pelvis may be ascertained with considerable accuracy by internal or external measurements, either with the hand or instruments to be presently described.

In the following table will be found the principal measurements, (exclusive of those already given at page 37,) in a well-formed female pelvis.

	Inches.	Lines.
1. From the anterior superior spinous process of one side to that of the other, - - - - -	8	6
2. From the anterior inferior spinous process of one side to that of the other, - - - - -	7	8
3. From the middle of the crista of one ilium to the middle of the crista of the other, - - - - -	9	4
4. Depth of the upper pelvis laterally, - - - - -	3	9
5. Depth of the lower pelvis laterally, - - - - -	3	9
6. From the anterior and superior edge of the symphysis pubis to the first spinous process of the sacrum, -	7	0
7. From the posterior edge of the tuberosity of the		

	Inches.	Lines.
ischium to the posterior and inferior spinous process of the opposite side, - - - - -	6	3
8. From the anterior superior spinous process of the ilium to the posterior superior spinous process of the opposite side, - - - - -	7	9
9. From the spinous process of the last lumbar vertebra to the anterior superior spinous process of either side, - - - - -	7	0
10. From the great trochanter of one side to the posterior superior spinous process of the opposite side, - - - - -	8	4
11. From the inferior edge of the symphysis pubis to the posterior superior spinous process of the ilium of either side, - - - - -	6	3

Different instruments have been constructed for the purpose of determining the capacity of the pelvis, and although, with these instruments, accuracy of measurement has not as yet been attained, still the results are so approximative, that their employment in no case should be dispensed with. In conjunction with manual exploration, they conduct to results sufficiently accurate for all practical purposes.

The form of the pelvimeter is various. We shall describe first

Fig. 23.



that of Baudelocque, which is intended for external measurement. This instrument, (see fig. 23,) is composed of movable arms, curved externally, and terminating at one extremity in a button, while the other is joined to its fellow by a hinge. The arms of this instrument separate sufficiently to embrace externally the antero-posterior or bi-trochanteric diameter of the pelvis, and the degree of separation of the button-like extremities, is marked by a gradual scale, which is attached to the instru-

ment. This instrument should be applied to the naked body, in such a way, as to place one of the buttons upon the symphysis pubis, and the other upon the first spinous process of the sacrum. Thus placed, the amount of separation of the two arms, would indicate the distance from the anterior face of the symphysis pubis, to the posterior edge of the spinous process of the sacrum. But in order to obtain the exact measurement of the sacro-pubic diameter of the superior strait, it will be necessary to subtract the thickness of the symphysis pubis, which is half an inch, and that of the base of the sacrum, which is two inches and a half, from the whole distance measured, which will give us the length of the diameter of the pelvic brim. The measurements obtained in this way are exceedingly uncertain, for the following reasons: 1st. The difficulty of placing the extremity of the posterior branch, upon the first spinous process of the sacrum. 2d. The thickness of the soft parts, at both points of application, varies. 3d. The thickness of the bones included in the measurement is not always the same, and the variation will be considerable, where there has been an arrest of developement. 4th. It only gives us the antero-posterior thickness of the pelvis, and therefore is inapplicable in other variety of deformities. 5th. Though it may determine externally the thickness of the antero-posterior direction of the pelvis, yet it does not indicate the degree of projection of the sacral promontory.

These objections hold with still greater force, where with the pelvimeter of Baudelocque, we attempt to measure the other diameters of the superior strait.

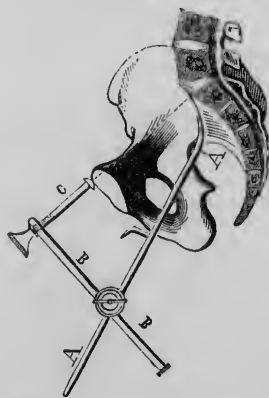
Notwithstanding these objections, the use of this instrument should not be entirely abandoned, for it may be employed where there is not much necessity of extreme accuracy, and where an internal exploration is inadvisable or impracticable, as is the case when the physician is called upon to determine the character of the pelvis of an unmarried female. In other cases, the internal exploration is preferable, but even here the information obtained by the application of the pelvimeter, might add somewhat to the facility of the diagnosis.

The objections to the external pelvimeter, are so apparent, that

many instruments for measuring internally the capacity of the pelvis have been invented. The first instrument of this kind was invented by Coutouly, and consists of two parallel branches which slide with equal facility upon each other, and terminate in two raised extremities, *one of which*, when introduced into the vagina, is placed against the symphysis pubis, *the other*, against the sacral promontory. A scale is attached to the horizontal branch, which indicates the exact separation, between the extremity placed against the pubis, and that placed against the promontory of the sacrum, or in other words, the measurement of the length of the sacro-pubic diameter. The danger of introducing this instrument, and the difficulty in placing one of its extremities accurately against the sacral promontory, form very serious objections to its employment.

Many modifications of this invention of Coutouly have been designed, but though in some cases there have been improvements, still the objections have not yet been done away with. We shall only speak of the instrument used by M. Van Huevel, professor at Brussels, which probably combines more excellencies than any

Fig. 24.



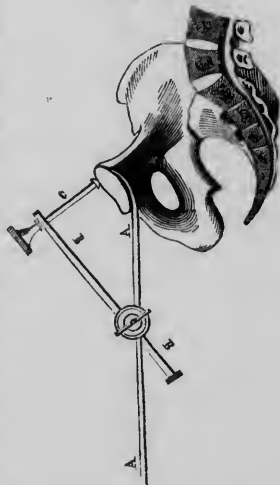
modification yet devised. This instrument is composed of two metallic rods, AA and BB (see fig. 24), united by means of a joint, so arranged as to allow the extension of the rods at pleasure, at the same time that this joint may be tightened by means of a nut-screw. The rod AA, intended to be introduced into the vagina, is curved anteriorly, and flattened at its extremity in the form of a spatula; the other rod, BB, is not so long, and is traversed at one extremity by a rod C, movable backward or forward, by means of a screw. In applying this instrument,

the female is placed upon her back, with the legs and thighs well flexed, and separated as widely as possible. The point on the skin corresponding to the upper edge of the symphysis pubis,

should be marked with a dot of ink ; at the same time, a similar mark may be made to designate the position of the ilio-pectineal eminence, for the purpose of measuring the oblique, as well as the antero-posterior diameter of the superior strait. This being done, one or two fingers should be introduced into the vagina, and placed against the sacral promontory ; when this has been found, the internal rod, AA, is to be inserted into the vagina, and carried along the fingers to the promontory of the sacrum, against which the broad extremity of the rod is to be placed. In this position it may be firmly held by hooking the thumb of the hand introduced into the vagina, over the hook attached to the rod AA. When this rod has been accurately placed, the button extremity of the rod C, should be fixed upon the dot of ink, indicating the superior edge of the symphysis pubis. When the point of union between the two rods has been made firm, by tightly screwing the nut, the instrument may be withdrawn, and the distance from the extremity of the rod C to that of AA, may be ascertained. But in order to obtain the length of the sacro-pubic diameter, we must subtract the thickness of the pubis, and to do this, it must be measured by re-introducing the instrument, as is seen in figure 25. The distance first ascertained, minus the thickness of the pubis, will give us the exact length of the antero-posterior diameter of the pelvic brim.

The length of the oblique diameter may be ascertained in a similar manner. In this case, the extremity of the rod AA must be placed against the sacro-iliac junction, while that of the rod C will rest on a point a little external to the iliac artery. If the sacro-iliac junction cannot be reached, we may measure, instead of the oblique diameter, the distance sacro-cotyloid, which will give us every measurement of importance, since, where the oblique

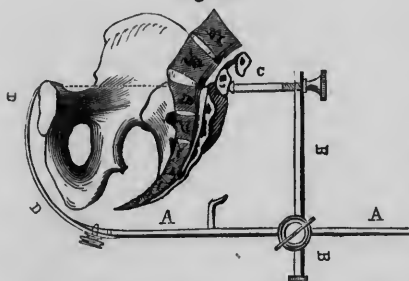
Fig. 25.



diameter is contracted, it is due (except in some cases of exostosis) not to compression inward of the sacro-iliac joint, but to that of the sacral promontory or the cotyloid cavity.

This instrument may be employed also in measuring the pelvis externally, but its application in this case is too simple to require

Fig. 26.



farther explanation. (See fig. 26.) Though the employment of a properly constructed instrument, like the above, should never be neglected, still manual exploration offers much more accurate results in determining the form and capacity of the pelvis. This knowledge

can be obtained by introducing the index finger into the vagina, and passing it upward for the purpose of reaching the sacral promontory. In making this examination, the female should be made to stand erect, with her shoulders firmly placed against the wall, or some other plane surface. If the index finger be introduced into the vagina, and carried upward and backward, it will soon come in contact with the sacral promontory. When this is reached, the radial portion of the finger must be brought into contact with the lower edge of the symphysis pubis, and if this point be marked, we will, upon withdrawing the finger, have, (subtracting six lines for the thickness of the symphysis pubis, and two or three lines for the obliquity of this measurement,) the exact length of the antero-posterior diameter of the superior strait. In some cases, it is not easy to reach the sacral promontory, with the finger; but where this is impossible, the obstetrician may conclude, that there is no deformity of this diameter, for where deformity exists, this promontory is very easily reached.

The antero-posterior diameter of the inferior strait may be ascertained by measuring with the finger the distance between the symphysis pubis and the extreme point of the coccyx. Allowance, in

this case, must be made for the regressive movement of the coccyx.

The distance between the tuberosities of the ischia may be easily measured, either with the finger, or with a pair of common compasses.

But how are we to measure the transverse and oblique diameters of the brim or excavation? It may be done in two ways: 1st, by making, with the index finger well introduced into the upper part of the vagina, a careful examination of the whole circumference of the pelvis; 2d, the whole hand may be passed into the vagina, and by placing all four fingers in a line with each other, we may ascertain the length of any one of the diameters, by the extent and ease with which the fingers may be separated.

During labour, it is not a difficult matter to ascertain whether the advance of the fœtal head be due to want of room in the pelvis, since it is easy to determine with the finger, what room there exists between the circumference of the head and that of the pelvis.

CHAPTER XVI.

Turning.—This is an operation by which one or the other extremity of the fœtus, is brought to present at the superior strait of the pelvis. If the head be brought down, it is termed cephalic version, but where the feet are made to present, it is termed pelvic version : this last is the mode usually adopted by obstetricians of the present day, though the first is not entirely abandoned, and may frequently be resorted to with great advantage.

1. *Pelvic version.*—In the writings of the ancients, we often meet with distinct allusions to turning by the feet, thus Celsus and Moschion, in their writings, advise that if the head cannot be brought down, the feet, when near the mouth of the womb, must be seized. The language of Moschion is distinctly this : “ Si pedes proximiores, ipsos teneat et sic adducatur ;” and Philumenus says, “ Sicaput fœtus, locum obstruxerit, in pedes vertatur, atque ita educatur.” From this explicit language, it can hardly be doubted that to these two obstetricians may be attributed the earliest positive suggestion of the art of turning by the feet. On this point Smellie makes the following remarks : “ Some of the moderns conclude that the ancients never turned and brought children by the feet, because Hippocrates directs in all cases to bring the head into the natural position, and says where delivery is performed by the feet, both the mother and child are in imminent danger. Celsus and all writers till the time of Parè adopted this practice of bringing the head to present. But at the same time many of them observe, that if this be not practicable, we must search for the feet, and deliver the fœtus in that way. Celsus says, if the feet are at hand, the child is easily delivered footling, and Philumenus goes still farther, saying, that if even the head should present, and the child cannot be delivered in that position, we must turn and bring it by the feet.” In 1561, Franco proposed the extraction of the child by

the feet, in cases calling for artificial delivery. This practice was adopted by, and according to some originated with, Ambrose Parè, who, in his treatise on Surgery, published in 1594, recommends pelvic version in cases of malposition, of hemorrhage, &c. Both Parè and his pupil Guillemeau, seem, however, to have preferred cephalic version, where it was practicable, and it was not till the time of Mauriceau, about the middle of the 17th century, that this new mode of version became greatly improved, and more generally adopted. Great merit is also due to Pue and De la Motte for having pointed out the necessity in these cases, of preserving the membranes unruptured, and the impropriety of pushing back the arm and hand, when they presented at the mouth of the uterus.

Almost all the accidents likely to complicate the cephalic presentations require, under certain conditions of things, a resort to the operation of pelvic version, and the operation may be called for in cases of malpositions of the fœtus, in cases of hemorrhage, convulsions, prolapsus of the cord, &c. As it is an operation not without danger, both to the mother and child, it should be performed in strict accordance with the rules which we shall lay down.

1st. Never resort to this operation unless there be an absolute necessity, and unless it can be accomplished with probable safety to the mother.

2d. Turning should never be undertaken unless the soft parts be sufficiently relaxed to admit of the easy introduction of the hand into the uterus; thus if the soft parts be relaxed and distensible, and if the os uteri be as large as a dollar, the hand may be introduced without much danger. Where the os uteri is easily dilated, even though it be not dilated to the size just designated, the hand may be carried into the uterus, if proper care and management be employed. This dilatibility of the os uteri may be told by its softness, its thickness, and by its yielding to a small amount of traction made on its fibres by the finger.

3d. If the os uteri be thin, and rigid, and not dilated beyond the size of a shilling, no attempt should be made to introduce the hand into the uterus, until the parts have been relaxed by venesection

and opium. This is a rule to which there should be no exception.

4th. As long as the membranes are unruptured there is no necessity for being in a hurry, except where hemorrhage, &c. exists; therefore previous to the discharge of the waters we should not attempt to turn until the soft parts are perfectly prepared for the passage of the hand.

5th. When turning becomes necessary, owing to excessive hemorrhage or convulsion, the hand should not be passed through the os uteri unless it be well dilated or dilatable. It must be remembered, however, that this condition of the mouth of the womb will soon yield to the spontaneous bleeding in the case of hemorrhage, and to the venesection always demanded in cases of convulsions.

6th. When turning is determined upon, before the membranes are ruptured, we must not rupture them as soon as the hand is passed through the os uteri, but it should be gently insinuated between the membranous sac and the internal surface of the uterus, until the upper part of this organ is reached, when the rupture may be effected and the version accomplished with more facility than if the sac had been early lacerated, so as to allow the discharge of a portion of the amniotic fluid.

Where the os uteri is dilated or dilatable, where the soft parts are relaxed, and where the waters either are not or have only recently been discharged, the operation of turning is easily effected, and it is for this reason that it should be undertaken as early as possible, since every moment's delay adds new difficulties to its execution. Unfortunately, it frequently happens that these favourable circumstances do not exist; that the soft parts are rigidly contracted; that in consequence of the early discharge of the waters, the uterus is so firmly contracted as to render the introduction of the hand exceedingly difficult, and when fairly introduced the version of the child can hardly be effected. The danger to the mother in these unfavourable cases consist in a laceration of the uterus and the other soft parts. The treatment in these cases will be described hereafter.

The danger in cases of turning is not confined to the mother, but extends to the child, and consists in, 1st. Compression of the cord. 2d. Compression of the head and chest. 3d. Great extension of the neck. These accidents may be partly avoided by observing the following rules: Never operate before the soft parts are relaxed. Never turn the child during the existence of a pain. Never extract the child rapidly, but slowly and during the existence of pains, and if these do not exist, they must be induced by the means already recommended.

When the operation is determined upon, the bladder and rectum should be evacuated by the proper means.

The position of the patient may be either on the back, or on the side, or on the knees and elbows: the first is preferable. The patient will then be placed on her back, and the nates brought to the edge of the bed; her feet should be permitted to rest on a chair, while the thighs, flexed upon the body, should be kept steady and well separated by an assistant.

The operator should assume that position in front of the patient, which he may deem most convenient and suitable for the occasion.

These arrangements being made, the position of the fœtus in utero must be carefully ascertained, for by so doing, the operation will be much facilitated, since it will enable us to make choice of the hand most favourable to the execution of the manœuvre. But this position cannot always be ascertained, especially before the membranes have been ruptured, hence we will not always have it in our power to make choice of the hand to be employed. For this reason, Mad. Lachapelle has asserted that it is immaterial which hand is used, and this is especially true where, the waters not having been discharged, the hand may traverse any part of the cavity of the uterus, and where "the child will be turned with as much facility as if in a bucket of water." Rigby always turns with the right hand. It is, however, always best, when practicable, to ascertain the exact position of the child, since the choice of hands, in each particular position, is a matter of great importance.

Having ascertained the position, and made choice of the hand, the coat should be taken off, and the shirt sleeve rolled up as high

as possible. The hand must be well anointed with some fresh lard, especially the knuckles, the natural roughness of which occasion much pain, during the introduction.

The hand must be thrown into a conical form, and pressed gently through the os externum, upward and backward, towards the promontory of the sacrum, at which point, the os uteri will usually be found. This must be passed gently, *not with force*, by insinuating within its circumference, first one and then another finger, until the whole have entered. A gentle movement of rotation must now be given to the hand, at the same time that it is pressed through the os uteri into the cavity of the uterus. All this must be done during the absence of uterine pain; our efforts at introduction always ceasing when the pains come on.

At this stage of the process, the membranes will be found broken or not; if they are ruptured, the hand should be carefully carried into the cavity of the ovum, but if not, care should be taken to pass the hand between the membranes and the walls of the uterus, until the upper part of the uterine cavity is reached, when the sac should be pierced.

The hand which is not employed, should be placed upon the fundus uteri, so as to steady the organ, while the other hand is carried up to the point where the feet of the fœtus are placed. The hand, which is applied externally, may aid by proper pressure, in facilitating the version.

When the introduction has thus far been accomplished, the arm will be found to lie in a line drawn from the fundus uteri, to the coccyx, the bend of the elbow being applied to the under part of the pubic arch.

If the uterus should, as it often does, contract upon the hand, the latter should be laid flat upon the body of the child, until the pain subsides, when our efforts to search for the feet may be renewed.

Both feet, if possible, should be grasped, so that the thumb shall be applied to the external malleolus of one leg, and the middle finger to the external malleolus of the other, while the index finger is to be placed between the two feet. This should always be done,

if possible, but as it is not always so, we should rest satisfied with any firm seizure of the two feet. (See fig. 27.)

Fig. 27.

When the feet have been properly seized, the version of the fœtus should be commenced. This should never be attempted except during the absence of a pain, and in bringing down the feet, they should be drawn over the anterior face of the body of the child, so as to avoid the flexion of the vertebral column backward, which would give rise to serious injury of the spine. (See fig. 27.)



If only one foot can be seized, our procedure will be two-fold: 1st, if the foot brought down point towards the anterior portion of the pelvis, the operation may be continued, without making search for the remaining foot. 2d, if, however, the posterior foot has descended, it will be necessary to retain it in its position by means of the fillet, while the hand is reintroduced, along the border of the leg already extracted, until it reaches the opposite or anterior leg, the border of which must be traced, till the foot can be grasped. Dewees says, when but one foot can be grasped at a time, care should be taken that it belong to the side over which the hand has passed, otherwise a severe twist will be given to the body of the child, and most probably defeat the attempt to turn. The leg which is grasped should be drawn toward its fellow. The operation of turning the child in the uterus should be made slowly and gradually, and during the absence of a pain. At the same time that our traction is made upon the feet, every effort should be made, with the hand externally applied, to aid in effecting the version.

After version has been accomplished, and the legs partially ex-

Fig. 28.



tracted, they must be seized as represented in fig. 28. Our traction should now commence, and should always be made during the existence of a pain, and in a line with the axis of the pelvis. Where, after the legs have been extracted, the pains seem sufficient for the completion of the labour, we should desist from tractive efforts; but when, as in hemorrhage, exhaustion or convulsion, there is absence of efficient pains, and necessity for hasty delivery, every proper assistance should be given for the purpose of extracting the child, at the same time that we use every means necessary to rouse the uterus to action. The patient should be re-

quested to bear down as much as possible.

Sometimes, difficulty is experienced in bringing down the breech, when the feet are delivered, owing to the head sinking in part into the superior strait. Baudelocque denies that this ever takes place; if it should, the head must be pushed up by the thumb, while the feet are drawn down by the fingers. Another difficulty, according to Blundell, consists in the fact that the breech is apt to become *seated* over the symphysis pubis, thus preventing its descent. In this case he says an attendant should gently push the fœtus to the back part of the pelvis, by pressing the hand over the space between the symphysis pubis and the umbilicus.

When the feet are delivered, the legs, thighs, and hips should be gently drawn through, and if the abdomen of the fœtus should be anteriorly, it must be so changed as to look towards the posterior part of the pelvis. These movements must all be executed slowly, and in unison with uterine contraction. No force must

be employed, and if from the contraction of the uterus upon the child, there should be difficulty in rotating the abdomen posteriorly, or if the head should not rotate with it, every attempt should be stopped.

When the breech has reached the vulva, we should examine the condition of the umbilical cord.

This may be done by passing a finger up as far as its insertion at the navel, and drawing down a loop sufficiently long to prevent its being ruptured in the farther delivery; (see fig. 29.) If the cord be hooked between the legs of the child, it should immediately be disengaged, and thrown back between the body of the child, and the posterior commissure of the perineum. Where the cord will not descend, and there is danger of its suffering, it is best to cut it, and without applying a ligature, according to Baudelocque.

Fig. 29.



At this stage of the operation, the condition of the soft parts should be examined before any attempt is made to deliver the shoulders, arms, and head. If the parts are lax, let the delivery be finished without delay; but if not, we must wait, for if the cord has ceased to beat, the child is already dead, and no harm can result from the delay, and even if it should still pulsate, and there should be danger of interruption to its circulation, it is better that the life of the child should be endangered, than that serious injury should be inflicted upon the mother. Besides this, if the parts are rigid, to bring the head down into the pelvis excavation, with a certainty of its delay at that point, would inflict more injury upon the cord than if no attempt had been made to draw down the head.

When the axillæ appear near the pelvic floor, the arms will be

applied upon the sides of the face of the child. The delivery of

Fig. 30.



the posterior arm must be first attempted, by passing the index and middle fingers over the shoulder and along the arm until the elbow is reached. When this is done, the elbow must be pressed downward and forward over the face of the child, when the arm will soon fall into the vagina; (see fig. 30.) If the head is large, it will sometimes be necessary to raise the body before we attempt this manœuvre, in order that more room may be gained for its execution. Where, on the other hand, the axillæ are too much elevated, the body of the child should be drawn down, so as to bring the parts within reach.

The arm next to the pubis must now be delivered, and though the difficulties in this case are greater than in the preceding, yet its execution is precisely similar. At this stage of the operation, the head will be either at the superior strait or in the pelvic cavity. If it be at the superior strait, it should be made to present its long diameter in the direction of the oblique diameter of the pelvis, and this may be done, either by acting early upon the body as we have already directed, or if this have been neglected, by now pressing the sides of the face with a couple of fingers, so as to turn it towards the right or left sacro-iliac junction. When the head enters the pelvic brim, it will, unless improper traction has been employed, be moderately flexed upon the body of the child, so that its passage through the upper strait, will be much facilitated. Its delivery in this flexed position, may be accomplished by the efforts of the mother alone; but if these are not sufficient, it will be necessary to elevate the body before the symphysis pubis, and by introducing two fingers against the occiput, and one on each side of the nose, (see fig. 31,) so as to push

the first over towards the sacrum, while the face is drawn downward and forward over the sacrum, coccyx, and perineum. During these manipulations, the body of the child must be supported with one arm, as is seen in fig. 31.

If, again, the head be within the excavation, (it is then usually entirely out of the uterine cavity,) and every effort should be made, in the way to be described hereafter, to throw the face into the hollow of the sacrum, when the delivery may be effected in the usual manner, always remembering, to draw in a line with the axis of the pelvis, and as the face is being delivered, to elevate the body gradually towards the abdomen of the mother, just as will be described in the delivery with the forceps.

Such is the description of the mode in which turning may be effected, when no serious obstacle to its accomplishment occurs. The difficulties are due to various causes.

1st. *Narrowness of the vulva.*—This does not often occur, even in primiparæ, unless there exist some unnatural adhesion of the parts involved, which must be relieved by judicious surgical treatment. In all other cases, the hand may be passed through the vulva, provided our efforts are gentle and well directed.

2d. *Resistance of the os uteri.* It has already been stated, that rigidity of the os uteri frequently offers the greatest difficulties in cases where version is called for. Where the os uteri is neither dilatable nor dilated, and when the rigidity is confined to the inferior segment of fibres, version may be demanded, from a malposition, or from the occurrence of hemorrhage, &c. In the first case, if version be decided upon, we must endeavour to effect the relaxation of the os uteri, by the employment of all the therapeutic means in our power, and it is very important that these means should be resorted to as early as possible, since the longer the de-

Fig. 31.



lay, the greater will be the difficulty in effecting version. In a case of this sort, our great remedy lies in copious venesection. Not moderate bleeding, but bleeding *ad deliquium animi*. Under this treatment the parts usually become moist, soft, and yielding, so that the hand may readily be introduced into the cavity of the uterus. But copious bleeding produces another beneficial effect, viz., a diminution of the uterine contractions, which frequently, as we shall see presently, interpose great difficulties in cases of version. If the bleeding should not produce the desired relaxation, opium should be employed. This medicine, we know, if used previous to the abstraction of blood, does not produce the same soothing and relaxing effect which is experienced, when its use is premised by venesection. When administered in this way, it serves not only to relax the tissues, but tranquillizes the uterine contractions. The use of tobacco has been advised in these cases, but though a powerful relaxant, it at the same time produces very dangerous prostration, and should not be employed. Warm fomentations and the warm bath have been recommended, but we are disposed to think the first would be useless, while the last might prove injurious by inducing hemorrhage.

If these remedies fail, the parts still remaining rigidly contracted, the uterus firmly contracted upon the *fœtus*, while the countenance of the patient is haggard and pale, accompanied with quick pulse, exhaustion and inflammation of the soft parts, we can hardly expect to succeed in any attempt at version, and no resource is left except possibly the perforator. In a case like this, the forceps are inadmissible, especially if it be a presentation of the body of the child.

But there are cases, such as hemorrhage, convulsions, &c., which may call for the operation of turning when it is rendered improper on account of the rigid condition of the *os uteri*. Under such circumstances Cazeaux advises us to force the hand through the *os uteri*, after having incised its circumference. This advice we consider bad, and would prefer relying upon the following given by Dr. Dewees.

“In the accidental preternatural labour, we must determine upon the necessity of interference, according to the extent or seve-

urity of the accident which may complicate it; and not exclusively by the good or bad position of the child. We, therefore, in such cases, regulate our conduct almost exclusively, as regards delivery, by the condition of the os uteri; should it be unfavourable to operating from the smallness of its opening, or its rigidity, we must, for the time being, abandon the idea of entering it to turn, or to effect any other important change upon the child, as it would require a force that would be wholly incompatible with the safety of the woman, or the preservation of the child. In the mean time we temporise in the best manner the nature of the accident which complicates the case will permit, by prescribing the remedies the most proper for the moment; or adopting such means as may best suit the exigency; as bleeding, opium, injections, &c. But on the contrary, if the os uteri offer no difficulty, we have only to consider the best moment to act, when we have the choice in our power. This choice must be governed by general, as well as particular rules; before, however, entering upon either of these, it will be necessary to point out the proper position of the woman, that both may be the better understood."

3d. The peculiar insertion of the placenta, called placenta prævia, will give rise to some difficulty in executing the operation of turning; the mode of procedure in these cases having been explained elsewhere, we need only refer to it on the present occasion.

4th. If the uterus be firmly contracted upon the body of the child, version will be rendered extremely difficult. In these cases, if the head presents in a favourable manner, it will be best to apply the forceps, but if there should exist a presentation of the body of the child, version alone is practicable, and in order that it may be accomplished, copious venesection, opiates, &c., should be freely resorted to. Where these remedies fail to induce sufficient relaxation, our only hope is in spontaneous evolution, and if this fail to occur, no other resource remains than to mutilate the child in the manner which will be explained hereafter.

5th. Where the umbilical cord is too short, it must, if its existence can be determined beforehand, be cut.

6th. The bis-acromial diameter may be so large as to enter the

pelvis with great difficulty. In this case our object should be to make this diameter correspond with the long diameter of the superior strait, and this may usually be done by rotating the body of the child, as soon as it has descended low enough to allow us to grasp it firmly. When this has been accomplished, our traction should be made so as to bring alternately first one extremity of the bis-acromial diameter, and then the other, into the pelvic excavation.

7th. The arms sometimes occasion difficulty by becoming fixed over the back of the child. The mechanism of this faulty position, and the best mode of treating it, is so well described by M. Cazeaux, that we shall extract the whole passage. He says: "It sometimes happens that one of the arms, usually the one directed towards the pubis, becomes crossed behind the neck at the time when we wish to effect its delivery. We have advised that the posterior face of the fœtus should be turned anteriorly if possible; but if in doing this we are compelled to give to the body an extensive *evolution*, the arms, rubbing against the womb, may easily become displaced by the efforts made, *not upon them*, but upon the body, and so crossed as to lie between the neck and the posterior face of the symphysis pubis. But it is important to remember, that in this way, according to the remark of Dugès, the displacement of the arm can take place in two ways: the arm may become crossed behind the neck, after having been first raised along the sides of the head, and the displacement is then effected from *above, downward*, and from *before, backward*, as it regards the fœtus. But this displacement may take place from below, upward; the arm then is raised along the posterior face of the fœtus, and becomes fixed below the occiput. This last mode merits some detail. The arms are originally placed along the sides of the thorax, and whilst the effort is made to turn the anterior face of the fœtus towards the loins of the mother, the body alone being moved, the arm may not participate in this rotation of the body. It then becomes placed upon the back of the fœtus. The obstetrician continues the traction, and whilst the body descends or is extracted, the arm is arrested against the symphysis pubis, and remains in this position until the neck descends upon the pubis. It is, however, sufficiently easy to distinguish each one of these

cases. When the displacement of the arms takes place from *above, downward*, and from *before, backward*, the inferior angle of the scapula is greatly separated from the median line of the spinal column, whereas it is very near (to the vertebral column) when the displacement is effected from *below, upward*, upon the back of the fœtus. It is evident that in these two cases the disengagement of the arm cannot be effected in the same way. As a general rule, the arm should be *replaced* by moving it in a direction exactly the reverse of that, which it took in being *displaced*. Thus in the last case, we should draw the arm from above downward along the back, by hooking the elbow with one or two fingers. In the first case, we should carry it first over the occiput, then along the side of the head, the face, and the sternum.

“This disengagement is at times exceedingly difficult, since the occiput, firmly pressed against the symphysis pubis, rarely leaves sufficient room between it and the pubis. It has been advised in these cases to elevate the thorax, so as to push up the occiput and permit the disengagement of the arm. It would be better, perhaps, after having disengaged the posterior arm, to impress upon the body and the head of the fœtus a movement of rotation upon its longitudinal axis, which would carry into the hollow of the sacrum, the occiput and the arm which we wish to deliver.”

8th. *Arrest of the head after the body has been delivered.*—This may be due either to pelvic deformity or to undue extension of the head, by which its largest diameters are brought into correspondence with the diameters of the superior strait. When pelvic deformity exists, so as to diminish the diameters of the brim below three and a half inches, we have no right to resort to the operation of turning. Our resource in these cases will be more fully explained when we treat of the forceps, and at present we need only say that in pelvic deformities, even of slight degree, it is best to employ the forceps, if their application can be made with ease and safety to the mother. Where the pelvis is of a normal size, and no improper traction has been exerted upon the body of the child, the head enters the superior strait well flexed, and in this case no difficulty will arise in its delivery. But if the pelvis be under size, or if improper traction have been exerted, the chin

leaves the breast, and the long diameters of the head offers to the diameters of the pelvic *brim*. According to Cazeaux, when the occiput lies in front, the resistance offered by the anterior lip of the os uteri, tends to increase the flexion of the head; but if the chin lie in front, the same part increases the extension, by preventing the descent of the chin during uterine pains. To correct this extension of the head, two modes of action will be required. 1st. Where the occiput is in front. This case is more easily rectified than where the chin lies in front. By turning to fig. 31, page 333, it will be seen that this may be done by elevating and supporting the body, at the same time that two fingers are introduced against the occiput, and one on each side of the nose; so that, while with the former we act upon the occiput, with the latter we draw the chin down, so as to produce the requisite flexion. If these efforts should fail, the whole hand may be introduced over the forehead and face, for the purpose of rectifying the position. Where these manipulations do not succeed, the vectis or forceps may be applied. 2d. Where the chin lies in front, the difficulties are much greater. In this case, according to Mad. Lachapelle,

Fig. 32.



the face must be turned to the concavity of the sacrum, by introducing one or the other hand, (as in fig. 32,) into the posterior part of the pelvis, so as to grasp with its palm the occiput and side of the head. When this is done, firm but gradual attempts should be made to rotate the face round to the hollow of the sacrum. If our efforts at rectification should prove unsuccessful, the forceps may be tried. In these cases, it will be observed that the head has partly or entirely entered the pelvis, but where it is entirely above the superior strait, every effort should be made, by pushing up the body, to permit the head to enter the brim in a flexed condition, and at the same time we should endeavour to turn the face backward, and make the long diameters of the head correspond with either the oblique or transverse diameter of the

superior strait. When we cannot succeed in this, the manual efforts above referred to should be tried, and where these fail, the forceps, the vectis, and the perforator may in their turn become necessary.

We will now describe the mode of turning in each particular case. As many of the accidents complicating labour may call for the operation of turning, it is evident that we may be forced to resort to it in every variety of position which the child may assume in the pelvis : thus, if hemorrhage or convulsion occur in vertex, or face, or breech presentations, version may become necessary ; in the two former cases, complete evolution will be required, while in the last, the operation will consist simply in bringing down the feet.

In the presentations of every variety, it will be essential to determine the position, since upon this will depend the choice of the hand to be employed, as well as the facility with which the operation may be accomplished. The rule on this point is this : employ that hand the palm of which will look towards the abdomen of the fœtus.

This operation should never be resorted to, where the vertex, breech, or face has escaped from the os uteri, because it will then be impossible to push up the presenting part, so as to permit the introduction of the hand into the uterine cavity, without inflicting serious injury upon the soft parts. In these cases, if artificial delivery be required, the forceps should be applied where the head or face presents, while in breech presentations, the fillet or blunt hook must be employed. It may be laid down as a general rule, that where the vertex and face present favourably, and have descended low into the pelvic cavity, the use of the forceps must be resorted to in preference to the operation of turning.

1st. *Of Version where the Vertex presents.*—The occurrence of some of the accidents which complicate labour, may render version absolutely necessary. Besides this, in cases where some faulty position exists, for example, where the forehead or ear presents, or where the long diameter of the head presents in the antero-posterior direction, the operation of turning may be called for, pro-

vided the means, already recommended, have failed to rectify these positions. In any of these positions, if the presenting part cannot be raised above the pelvic brim, of course version will be impracticable.

In the left occipito-cotyloid position, version may be effected in the following manner. After the evacuation of the bladder and rectum, the female should be placed in the position already recommended, when the left hand (in accordance with the rule, which is to direct our choice) well greased, should be passed into the vagina until the presenting part is reached. This part should be grasped with the fingers on one side and the thumb on the other, and lifted up sufficiently high, to allow its being placed in the iliac fossa of the left side, where it should be retained by the wrist and fore-arm, until the feet have been seized and brought down through the mouth of the womb, when the delivery may be effected, as has been described; always remembering to act slowly and gently, and to rotate the body so as to throw the face posteriorly. The right occipito-cotyloid position is delivered in the same manner, *except that the right hand is employed instead of the left.*

In the right occipito-sacro-iliac position, the right hand will be used, and the head placed in the right iliac fossa. In every other respect the mode of delivery does not differ from the one just described.

In the occipito-pubic position, either hand may be employed. When the head has been grasped, the occiput should be turned round, so as to be placed in one of the iliac fossæ. When this has been done, the delivery may be accomplished as before.

In the left occipito-sacro-iliac position, the left hand is to be employed, &c., &c.

In the occipito-sacral, either hand may be introduced, and our action will be similar to that recommended in the occipito-pubic position.

2d: *Version where the face presents.*—In face presentations, the accidents of labour, malpositions of the face, or slight deformities of the pelvis, may give rise to a necessity for version, which may be accomplished whether the face be high up, or well descended

into the pelvic excavation. In the last case, however, turning cannot be effected, unless the presenting part can be raised above the pelvic brim. When this is impossible, as it frequently is, our principal means of delivery consists in the application of the forceps.

Where the chin points to the left ilium, the right hand is to be employed, and when the presenting part has been reached, it must be elevated above the brim, and placed in the right iliac fossa, when the seizure of the feet, and the subsequent delivery, must be effected in the usual way.

Where the chin presents towards the right ilium, the left hand must be used, and the operation effected in the way just described.

Where the chin looks towards the sacrum or pubis, either hand may be employed.

3d. *Version where the breech presents.*—The occurrence of any of the accidents of labour may call for version in these presentations. If the knees or feet present at the mouth of the uterus, or hang in the vagina, there will be no difficulty in drawing them down, when the delivery may be accomplished according to the rules already laid down. But frequently the inferior extremities are placed along the anterior face of the child's body, and the breech itself offers at the mouth of the uterus. If it be above the pelvic brim, or but partially descended into the pelvic cavity, the hand (the choice of which must be made in accordance with the rule already given), may be introduced, and the breech raised, so as to place it in one or the other iliac fossa. When this is done, the feet should be seized, brought down, and the delivery effected in the usual manner. When the sacrum offers toward the left side of the pelvis, the left hand must be employed, and vice versa. When, however, the breech has so far entered the pelvic excavation, as to prevent its being pushed up, other means must be adopted for the purpose of effecting the delivery; thus, if the part rest upon the pelvic floor, the fingers may be hooked over the groins, so as to extract the breech. If, however, the groin cannot be reached, the blunt hook must be passed up between the pubis and the breech, (and where this is impossible, between the thighs

of the child,) and when sufficiently elevated, it should be rotated so as to embrace the groin, when traction may be commenced.

4th. *Version where the body of the child presents.*—This class of presentations usually require version by the pelvis, unless perchance spontaneous evolution should take place. As the object in turning, in these cases, is simply, unless the malposition be complicated with hemorrhage, &c., to rectify the position, we should, as soon as the feet are brought down, leave the subsequent delivery to the natural efforts, provided these have not ceased to exert their influence.

Presentations of the body have all been treated of under the head of shoulder presentations, and of these we admitted two positions for each shoulder. In these cases, as far as the operation is concerned, it is immaterial, whether the arm protrude into the vagina or not, though, when it does occur, the position of the child is more easily ascertained. Having ascertained, by the diagnostic signs already indicated, the position of the child, we must proceed to version in the following manner.

In the right cephalo-iliac position of the right shoulder, the right hand must be introduced, and after having placed the presenting part in the right iliac fossa, the hand must be carried into the left part of the uterine cavity (see fig. 33), when the feet will be found. These must be seized in the usual way (see fig. 34),

Fig. 33.



Fig. 34.



and drawn, by a lateral evolution, to the mouth of the uterus, when the delivery may be finished according to the rules already laid down.

In the left cephalo-iliac position of the right shoulder, the anterior face of the child's body being directed posteriorly, the right hand must be introduced, and the delivery effected in the usual way.

In the left cephalo-iliac position of the left shoulder, the anterior face of the child looks anteriorly. The left hand must be introduced.

In the right cephalo-iliac position of the left shoulder, the left hand must be introduced. The subsequent delivery in all these cases being similar, we have only deemed it necessary to specify the hand employed in each particular case.

Cephalic version.—This mode of turning is not much in vogue at the present day ; still there are some who recommend it, in certain cases, which we will now specify.

1st. *In irregular presentations of the head, as of the forehead, the ear, and some cases of face positions*, the vertex may be made to present regularly. This manœuvre does not strictly constitute *version*, but simply rectification of the head. The mode of operating in these cases has been already described, and it is now unnecessary to repeat these instructions.

2d. *In presentations of the body of the fœtus*.—Towards the termination of utero-gestation, it is possible, even before labour commences, to ascertain if such malposition exists. The length of the transverse diameter of the abdominal tumour, the presence of the fœtal head in one or the other iliac fossa, which may be determined by an examination through the abdominal walls, the difficulty, in examinations per vaginam, of reaching the presenting part, render the diagnosis simple. When the position has been thus ascertained, it may be rectified by correcting the uterine obliquity, at the same time that the pelvic extremity of the fœtus is carried towards the centre of the abdomen. While this movement is executed with one hand, we should endeavour, with the other, to push the fœtal head towards the pelvic brim. In this manœuvre we may sometimes succeed, but the difficulty in maintaining the

fœtus in this position, diminishes our chances of permanent rectification.

If labour has commenced, and the membranes be unruptured, we may join to the external manœuvre above described, the attempt, (with the fingers introduced into the vagina,) to throw the presenting part to the side of the pelvis, opposite to that in which the fœtal head is placed, and as soon as this last is brought over the pelvic brim, the membranes should be ruptured, when the force of the pains will fix the head in the superior strait.

In the same malposition, when the waters are discharged, the same manipulation will be required, but the successful rectification is hardly possible. It may be tried, however, especially where there exists pelvic deformity. In presentations of the pelvis, we can hardly imagine that any attempt to bring the head down would succeed; but it may be tried, especially where the pelvis is contracted.

In all cases, where, from accident of any kind, immediate delivery is required, we would consider it best to turn by bringing the feet down, since the chances of failure in attempting cephalic version are so great, that the life of the mother would be endangered by such delay.

CHAPTER XVII.

The Application of the Forceps.—Though Chamberlen invented the forceps about the middle of the seventeenth century, their description and application were not made public, until the publication of Chapman's work on Obstetrics, in 1733. Since that time, the instrument has undergone various modifications, which in a work like the present, it will be unnecessary to discuss farther than to say that we prefer the *long* to the *short* forceps, and of these we give the preference to the instrument modified by Professor Hodge of this city. The following description of this modification of the forceps, is given by Dr. Hodge himself, in a communication to Professor Huston: "The great object of the forceps is to extract the head of the *fœtus* from the mother's organs, in suitable cases, without injury to the mother or child. It is notorious that injuries to one or both parties frequently result, exciting a too well-founded dread of this instrument in the minds of females, and even of physicians. Many causes contribute to this unfortunate result. No doubt much depends on the size, weight, and especially on the form of the instrument employed, a fact confirmed by the almost innumerable varieties which have been suggested. The instrument, as heretofore used, is evidently imperfect; and the one now suggested, is presented under the impression that, while it maintains all the excellencies of the former varieties, the injurious influences are partly, if not wholly, avoided. It is a modification of the long French forceps, but may be well termed an eclectic forceps, as combining, as much as possible, the peculiar excellencies of the English, German, and French varieties.

"The advantages of the French or long forceps are, I think, many and decided, as 1st, by them, any operation pertaining to this instrument, can be performed. There is no necessity to vary the form, structure, or size, of the instrument, whatever may be

the presentation of the head, its position, or its location. 2d. By them, sufficient power can be applied in cases of necessity, which cannot be done by the short forceps. Their leverage is greater. 3d. The narrowness of the blades, which, without detracting from the utility of the instrument, will allow of their application to the sides of the head, even in oblique and transverse positions. Many of the modern English forceps, are too broad to allow the proper manipulation of the instrument in the cavity of the pelvis. They cannot be introduced through the vulva without pain, especially in first labours. The French forceps can very generally be applied without pain.

“4th. It may be added as another advantage, that as habit in the use of an instrument is all-important, the practitioner will sooner become accustomed to a forceps which he can employ on all occasions, than when he is obliged to vary it continually; especially when it is remembered that among the strong and well-formed females of America, cases for the forceps are not very numerous in the circle of any practitioner.

“The disadvantages, which experience has taught me arise from the French forceps, are—

“1st. Its unnecessary weight.

“2d. The pelvic curve, in the variety most in use in this country, is not sufficiently great. Hence when the head is high in the pelvis, the perineum will be too much pressed upon, or else the blades will be applied in the direction of the occipito-frontal or longitudinal diameter, instead of the occipito-mental or oblique diameter.

“3d. The divergence of the blades commencing at the joint must necessarily distend the vulva (especially its posterior margin) prematurely, and when the head is high up, gives pain and endangers the laceration of the perineum.

“4th. The small size and kite-like shape of the fenestra prevents any portion of the cranium, even of the parietal protuberances, projecting into their openings: hence the hold on the head is less firm, and space is occupied by the blades, the thickness of which is added to the transverse diameter of the head.

“5th. The flatness of the internal or cephalic surfaces of the blades—so that the margin of the fenestra, often measuring three-eighths

of an inch, is much thicker than the external edge of the blade—increases the space occupied by the instrument. Hence in cases of difficulty, where compression is employed, contusion or even wounding of the scalp results.

“6th. The mode of junction of the French forceps is decidedly inconvenient when compared with the English, and especially with the German mode.

“These disadvantages I have endeavoured to obviate without diminishing or circumscribing the utility of this most valuable instrument, to which the profession and the public are so much indebted. My experience encourages the hope, that the attempt has been in a very great degree successful, so that even in inexperienced hands, the dangers of the forceps have been materially lessened.

“1. The weight of the instrument has been diminished from twenty ounces, avoirdupois, to seventeen ounces.

“2. The pelvic curve has been slightly increased, so that the perineum may not be dangerously pressed upon when the blades are in the axis of the superior strait. To counteract any loss of power which may ensue from the increased curvature, there is an angular bend in the handles, in an opposite direction, that the direct line of traction may be preserved, a suggestion of our skillful and experienced instrument-maker, Mr. Rorer.

“3. The shanks or commencement of the blades are nearly parallel, diverging no more than is absolutely necessary, until they approximate the head of the child, when a more rapid curvature, than in the Levret forceps, occurs.

“4. The proper blades of the instrument, from the shanks to the extremities, are nearly of the same breadth throughout, being equal to that of the extremity of the French forceps.

“5. The advantages are a more secure hold of the head, and especially allowing larger fenestræ, so that the parietal protuberances may project into the openings, and no space be occupied by the blades, when properly applied.

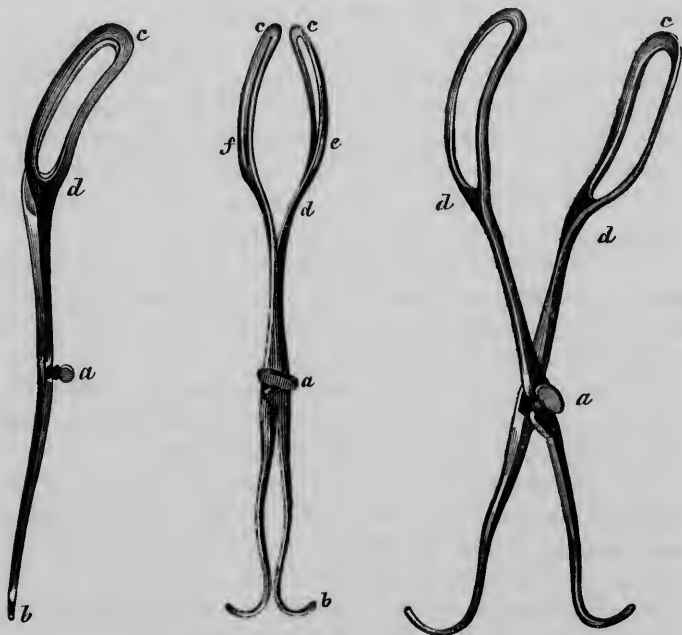
“6. The cephalic surface of the blade is concave, so as to be adapted to the convexity of the head, as suggested by Dr. Davis in his improved forceps, hence no edges touch the scalp, and there

is no wounding of the tissues, even when great compression is made.

“7. The very ingenious and scientific mode of locking the blades, as in the German or Siebold’s forceps, by means of a conical pivot, and the corresponding oblique conical opening for its reception, is adopted, by which all the facilities of the English junction are enjoyed, and the security and firmness of the French joint are maintained.

“The eclectic forceps weighs one pound and one ounce, being nine ounces lighter than the French forceps, as usually manufactured by Rorer, of this city, and eleven ounces lighter than a specimen of Dubois forceps in my possession, made in Paris.

Fig. 35.



“The whole length of the instrument (see Fig. 35) in a direct line from *b* to *c* is 16 inches; from the joint *a* to the extremity *b*,

the length of the handles, is 6·8; from *a* to *d*, length of parallel shanks, is 3·5; from *d* to *c*, the proper blades in a direct line, is 6 inches; from *c c*, the extremities, to *e f*, the greatest breadth, 3·7 inches.

“The separation between the points *c c*, when the handles are in contact, is ·5 of an inch; from *e* to *f*, the greatest breadth when the handles touch, is 2·5; when the separation at *e f* is 3·5, the points *c c* are separated to 2 inches; the breadth of the blade is 1·8, slightly tapering to 1·7 near *c c*, the extremities. The breadth of the fenestra is 1·1; the thickness of the blade is ·2 of an inch. The perpendicular elevation of the points *c c*, when the instrument is on a horizontal surface, is 3·4 inches, which indicates the degree of curvature of the blades.

“The elevation of the handles near the joint, above the same horizontal line, is 1·3 (including the thickness of the blades), which indicates the extent of the angular bend in the handles.”

A careful perusal of these judicious remarks of Professor Hodge, will impress the student with the advantages of the eclectic forceps, and will render any farther description of this instrument unnecessary.

The forceps possesses a twofold power: 1st. They act by compressing the head so as to diminish, to a certain extent, the length of some one of the diameters of the fœtal head. It frequently happens that the bi-parietal diameter of the head is somewhat larger than the antero-posterior diameter of the brim, and as the forceps are usually applied along the sides of the head, this diameter may be so compressed, as to enable it to pass with facility the brim of the pelvis. It must be remembered, however, that there is a limit beyond which compression cannot be carried with safety to the child, and therefore, where the contraction of the pelvis is so great, as necessarily to involve the life of the child during delivery, the compression should not be employed. The amount of compression which the head will bear, has been a subject of experiment, the results of which are given by Baudelocque, as follows:

No.	Reduction in Bi-Parietal M.	
1	3 lines	At this degree of reduction, the suture was torn, and the brain escaped.
2	2 lines	Instrument bent.
3	2 lines	
4	4 lines	Bones very soft, sutures and fontanelles loose.
5	4 lines	Equally soft.
6	4½ lines	The same
7	3 lines	
8	2 lines	The ninth experiment is not stated by Baudelocque.

On this point, Dr. Meigs makes the following judicious remarks: "One of the most dangerous errors relative to the forceps that a student could take up, would be the opinion that the forceps is a compressive instrument; by its very design it is not so; it is an extractor—it is a *tire tête*; and I think it ought to be established as a principle in obstetrics, that, where there is not space enough for the descent of the head without the forceps, there cannot be produced a due proportion by merely squeezing the head down to the desired dimensions by such an instrument."

We certainly agree, that compression should be limited, but at the same time, we think, that a slight compression in moderately contracted pelves is sometimes of the greatest importance in effecting delivery, and if the pressure be made slowly, no injury can result to either mother or child. In giving this opinion, we are disposed partly to adopt the language used by Rigby in his *System of Midwifery*; he says: "The slow and gradual pressure of the forceps thus exerted (by tying the handles together, and tightening them after every successive effort) upon the head of a living *fœtus*, will have a very different result to that of the experiments of Baudelocque and others, in attempting to compress the head of a dead *fœtus* by the application of a sudden and powerful force."

2d. The forceps act powerfully as an agent of extraction when the natural efforts are insufficient in effecting delivery.

The application of the forceps is resorted to much more frequently in some countries than in others; thus, among British practitioners, the forceps are applied about once in 362 cases.

Among the French, once in 162 cases. Among the Germans, once in 153 cases.

In cases where the forceps have been employed, the mortality (among the British obstetricians) to the mother is one in $21\frac{1}{2}$ cases; to the child, one in $4\frac{1}{2}$. Among the French and Germans, the death of the mother occurred once in $13\frac{1}{2}$ cases; that of the child once in 5 cases. These statistics are only approximative, since in many instances, the result to the mother is not mentioned.

The objects in resorting to the application are, 1st. To supply the want of uterine power in effecting the delivery of the child. 2d. To hasten delivery where there exists dangerous symptoms to the mother, either from too prolonged labour, or from convulsions or hemorrhage, or exhaustion, or from resistance of the perineal muscles. 3d. To aid in the delivery where there exists a malposition of the fœtus, either at the superior strait, or in the pelvic excavation. 4th. To assist the delivery where there exists a slight deficiency of space at the superior or inferior strait of the pelvis. By acting judiciously in some of these cases, the resort to the perforator may be avoided.

The application of the forceps is inadmissible, where the os uteri and the other soft parts remain rigid and undilatable. Where the cord is too short, or where it is twisted around the neck of the child. Where there exists a great disproportion between the head and pelvis. There will be in these cases, an absolute necessity in examining the degree of deformity, which the pelvis has undergone, and as a general rule it may be stated, that where the small diameter of the superior strait has been contracted to three inches, the forceps cannot be employed successfully in the delivery of the head, where the fœtus has arrived at the full term of utero-gestation. If, however, the fœtus should be under size, then, notwithstanding the contraction of the small diameter of the brim, to less than three inches, the head may be, by gentle compression with the forceps, drawn through the superior strait. Hence we see the necessity in these cases of an accurate examination of the size of the pelvis and the head of the child.

Where from want of natural proportion between the pelvis and the fœtal head, the forceps are inadmissible, (turning being equally

so) a resort to the perforator or the Cæsarean section will be demanded. In these cases, it is well to try if the delivery cannot be effected by a gentle and careful use of the forceps, since our means of accurately ascertaining the degree of pelvic deformity, are not so reliable as could be wished.

If the contraction of the superior strait has not reached three inches, the forceps may be successfully employed, and a preference in cases of slight deformity should be given to the use of the forceps over the operation of turning, since in this, the difficulties of delivering the head after the body has been extracted, are much greater, than where the head has been extracted in its original vertex presentation. In all cases where the proper relation between the diameters of the child's head and those of the pelvis does not exist, the application of the forceps should be carefully made, and the traction gently executed, avoiding, if possible, the least injury to the mother.

It may then be concluded, that if the soft parts be dilated or easily dilatable, the forceps may be employed, where the uterine contractions are feeble and irregular; where exhaustion exists, or inflammation threatens; where hemorrhage or convulsions occur; and where there is a slight contraction of the pelvis; remembering always that the object in using the forceps is to supply, by tractive efforts, the deficiency of uterine contractions, and not to compress the head of the child beyond a certain point, so as to draw it, regardless of injury to the mother, through a greatly contracted pelvis. Again, where the labour has been tedious, as is frequently the case in first labours especially, we must not be guided *entirely by the length of time* which has elapsed since the dilatation of the os uteri, *but by the general condition of the patient*; for instance, if the female has not been in labour for twenty-four hours, and if no dangerous symptoms occur, there will be no necessity for interference; if, however, labour has continued twenty-four hours or more, and dangerous symptoms make their appearance, artificial delivery must be resorted to; or if dangerous symptoms arise, independent of the duration of labour, the moment for interference has arrived, and the delivery should be effected as speedily as possible.

The application of the forceps, when the head has descended into the pelvic cavity, or through it to the inferior strait, is not, under ordinary circumstances, a difficult matter, but where the head is above the superior strait, the difficulty is much increased. 1st. Because the distance of the head from the vulva is so great that the position is rendered uncertain, and we are frequently compelled to employ the instruments, regardless of the position in which the head is placed. 2d. The mobility of the head above the superior strait renders its seizure exceedingly difficult. 3d. The hold of the forceps upon the head being uncertain, the instrument is apt to slip and injure the soft parts of the female. For these reasons we would limit their use while the head is above the pelvic brim, and employ them, in this case only, as a substitute where turning is impracticable.

The British practitioners limit the use of the forceps, not entirely, but principally, to those cases where the head has escaped partly from the uterus, and where it has descended so low in the pelvis that the ear may be felt. On this point, Dr. Lee says: "The membranes must be ruptured, and the os uteri fully dilated, before the forceps can be safely applied. The head may not have wholly escaped from the uterus, but *the greater part must have done so, to render it possible to use the forceps without great risk. If the whole circumference of the os uteri can be felt, you must not think of the forceps*, and the greatest care is required, though the posterior lip has gone up beyond the reach of the finger, if the anterior lip and cervix can be felt between the head and the symphysis pubis. I have never met with a case in which the forceps was satisfactorily applied, before the os uteri was fully dilated, and the head had descended so low that an ear could be felt." Burns says, in almost every case, "where the forceps are beneficial, the head has so far entered the pelvis as to have the ear corresponding to the inner face of the pubis, and the cranial bones touching the perineum." The opinion of Merriman is, that "no case is to be esteemed eligible for the application of the forceps until the ear of the child can be distinctly felt." Smellie entertained a similar opinion, and Dr. Collins of Dublin says, "The delivery of a female with the forceps, when the os uteri is fully dilated, the soft parts

relaxed, the head resting on the perineum, or nearly so, and the pelvis of sufficient size to permit the attendant to reach the ear with the finger, is so simple that any individual with moderate experience may readily effect it. I have no hesitation in asserting that to use it under other circumstances is not only an abuse of the instrument, but most hazardous to the patient. It is from being thoroughly convinced of these facts, by long and extensive observation, that I consider the forceps quite inapplicable where the head becomes fixed in the pelvis, and that the ear cannot be reached by the finger, except by violence, in consequence of disproportion existing between the head and the pelvis, either owing to the former being unusually large, or the latter under size; in most cases measuring little more than three inches from pubis to sacrum, and in others less than this. When we consider that the blades of the smallest sized forceps used in Britain, even when completely closed, measure from $3\frac{1}{8}$ inches to $3\frac{1}{2}$, it is clear that were the bones of the pelvis denuded of their soft parts, there would not be space to admit of their application. The French forceps measure from blade to blade on the upper side, $2\frac{1}{2}$ inches, and are about $\frac{1}{8}$ wider on the opposite side, meeting at the point of the blades to within $\frac{1}{8}$ of an inch. Were we even to overlook altogether the safety of the mother, where the child's head, $13\frac{1}{2}$, $14\frac{1}{2}$, 15 inches in circumference, is so compressed, as it must be, when the instrument is closed, there can scarcely be a hope of life. Of course when the pelvis is roomy, this compression of the head so as to close the forceps is unnecessary, and in such cases the child is uninjured. How is it possible with the forceps to drag a child through the pelvis, when there is not space, except by force, to introduce, (as is commonly said,) a straw, or when the smallest flexible catheter cannot, in some instances, be passed into the bladder? The results I have witnessed from such practice were most distressing; in some, the neck of the bladder or urethra either lacerated, or the injury by pressure from the forceps so great as to produce sloughing and consequent incontinence of urine; in others, the recto-vaginal septum destroyed, either of which renders the sufferer miserable for life; and in two cases, where the mouth of the womb was imperfectly dilated, so much

injury inflicted on this part, as to terminate in death. Such melancholy consequences strongly show the necessity of having recourse to the forceps with great caution, so as to avoid the use of an instrument, which when judiciously applied is occasionally most beneficial. Almost all the unfavourable results may be prevented by using the instrument, only when necessary for the safety of the patient, at the same time attending to the circumstances already stated, which are dwelt upon by many of our best writers on this subject, when treating of the nature of the case in which it is eligible." Dr. Joseph Clarke says: "Cases of convulsions excepted, I have rarely had reason to be pleased with the effects of extracting instruments, and not unfrequently have I had much reason to deprecate their evil consequences. Whenever labour is protracted to a dangerous length by unusual resistance, there is nothing but mischief to be expected from their application, but where the expelling powers are impaired by debilitating causes, the interposition of an artificial extracting power is more rational and justifiable."

We have quoted thus fully the opinions of the different British practitioners, not in entire approval, but for the purpose of showing the difference existing between them and the continental writers in regard to the application of the forceps. The continental writers do not accord to the maxim that the forceps should never be applied, until the head had descended so low as to allow "an ear to be felt," but they extend the application of the instrument to those cases where the head has just entered the pelvic brim, and even where it lies above the superior strait. In this opinion we believe the American obstetricians agree. On this point we would lay down, for the guidance of the student, the following rule: that if artificial delivery become necessary, while the head is at or above the superior strait, it will be best to resort to turning, where it is practicable, even though there be a *slight contraction* of the pelvic brim; but if the deformity be so considerable as to give rise to the least suspicion that there will be difficulty in the delivery of the head, then the use of the forceps is preferable to version, because the delivery of the head in the latter case is much more difficult than in the former.

Another question, about which the profession differ materially, is this : in tedious labours when are we to interfere? If the head be arrested in its progress, and if, after continued uterine action for some hours, the presenting part should fail to advance *at all*, then the sooner we interfere the better, without waiting for the occurrence of unfavourable symptoms. But if, on the contrary, the progress be ever so little, if the pains, though slight, still continue, there will be no necessity for interference, unless dangerous symptoms of exhaustion or inflammation arise. Burns, Hamilton and Campbell are for interference in these cases of slow progress, but Denman, Osborne, Ramsbotham, Blundel, &c., are opposed to it, and Dr. Collins says, " that so long as the head advances ever so slowly, the patient's pulse continues good, the abdomen free from pain on pressure, and no obstruction to the removal of urine, interference should not be attempted unless the child be dead." The bill of mortality is largely in favour of this plan of treatment, since it is there shown that the mortality is less, both to mother and child, than when the case has been interfered with, by a resort to the forceps. A full and able discussion of this subject will be found in Dr. Murphy's work on Obstetrics, to which we would refer the reader.

If, however, in tedious labours, the head has ceased to advance, or if it advance ever so slowly, and the soft parts are much compressed, hot and swollen, if the bladder cannot be emptied without the catheter, if there be fever, quick pulse, pain in the belly, exhaustion, &c., it will become necessary to interfere, without any reference to the time of duration of the labour. *The symptoms above alluded to, and not time*, are to govern us in all cases of tedious labours. In these cases, it frequently happens, from the undilated condition of the os uteri, &c., that the use of the forceps, as well as turning, will be impossible, and here our only resource will consist in perforation.

In applying the forceps, the following general rules must be attended to.

1st. The patient should be placed upon her back exactly in the position recommended for turning.

2d. The bladder and rectum should be emptied of their con-

tents, the first by the catheter, if necessary, the last by means of an enema.

3d. Before using the instrument, it will be proper to apprise the patient and her friends of the nature of the operation, of its probable success, and, by showing her the instruments, prove to her that they are not calculated, when carefully used, to injure either her or the child.

4th. Examine the condition of the soft parts, which should be soft, and dilated or dilatable. At the same time the exact position of the presenting part should be ascertained if possible.

5th. The instruments should be warmed to a temperature equal to that of the patient. They should also be well greased.

6th. The forceps may be applied to the head, where either the vertex or face presents, or where it remains in the pelvis, after the body is expelled. By some, it has been recommended to apply them over the iliac bones in cases of breech presentations; but this is doubtful practice, since the form of the part, and the delicacy of these bones so early in life, would hardly afford sufficient grasp for the purpose of extraction.

7th. The concave surface of the blades of the forceps should be applied, whenever it is practicable, to the sides of the head, in such a way, as to grasp it, in a line nearly parallel with the occipito-mental diameter. This is not always practicable, for in some cases, as we shall see hereafter, we will be obliged to apply the forceps, so that the forehead and occiput shall be the points compressed.

8th. The forceps should always be applied so as to bring, at the termination of the delivery, the concave edge under the symphysis pubis.

9th. The posterior branch is generally the one to be first introduced.

10th. The male branch or blade is to be held in the left hand, and is always to be applied to the left side of the pelvis. The reverse is true in regard to the female blade. The introduction of the blades should be effected during the absence of uterine pains.

11th. The hand which is free is to be used as the director of the blade which is being introduced. When the presenting part is low

down, the introduction of one or two fingers only will be required, care being taken to insinuate them between the head and the circumference of the os uteri, so as to prevent the latter from being grasped under the blade of the forceps. When the presenting part is very elevated, it will be necessary to introduce the whole hand into the vagina, for the purpose of giving the proper direction to the blade of the instrument.

12th. The blades should be introduced into the posterior part of the pelvis, when they may, by a spiral movement, be gradually drawn round, so as to clasp the side of the head.

13th. No force should be used in pushing the blades up to the proper point ; if, as sometimes occurs, the soft parts of the mother, or the scalp or ear of the child, should prevent the proper application of the blades, the difficulty must be overcome by gentle manipulation, and not by force.

14th. If, when applied, the forceps should not lock easily, they should be withdrawn and reapplied.

15th. Slight compression must be used, and traction should be made during the existence of uterine pain. The handles need not be tied, and the compression should be relaxed between each tractive effort.

16th. Before using traction, we should be sure that no portion of the patient is within the grasp of the forceps. If any portion of the vagina, vulva or uterus be included, the least compression will produce violent pain, and the cries of the patient will warn us of the accident. Care should also be taken that none of the capilli are included within the lock of the forceps.

17th. Traction should always be made in the direction of the axis of that part of the curve (formed by the pelvis and perineum) at which the head is successively placed.

18th. In making traction upon the head, each effort should be made from side to side, so as alternately to convert each blade of the forceps into a species of lever. During the delivery, the head should be rotated into its proper position.

19th. Our traction should always be made in the direction of the axis of the canal, through which the presenting part must pass ; thus, if the head be at the superior strait, the traction will first be

made in the direction of its axis, by throwing the handle of the instruments back against the posterior commissure, but as the head advances through the excavation, the direction will be changed, and the handle of the instrument will be gradually raised towards the abdomen of the mother.

20th. If pains continue until the head has nearly passed the external parts, our traction may be suspended, (though the forceps should not be removed,) so as to allow delivery to be accomplished by the natural efforts, if possible. In not removing the instrument, but merely suspending the traction, there will be no necessity for their re-application, if the natural expulsive efforts should cease, before delivery has been effected.

21st. The handle of the forceps must be seized with the right hand, and compressed sufficiently to give a firm hold upon the head, but where the pelvis is deformed, a greater amount of compression will be required. The left hand must be applied over the joint or lock of the forceps. When all this has been arranged, traction may be commenced, by gradually, and to a moderate extent, swinging the handle from side to side, at the same time changing the direction of our efforts, as the head advances through the pelvis, and over the perineum. As the head passes over the perineum, the latter should be carefully supported as in ordinary labours.

We will now describe the mode of applying the forceps, in each particular position of the vertex, face, or base of the cranium, whether placed above the superior strait, or partly within it, or at the inferior strait.

1st. *The application of the forceps when the vertex has descended as far as the inferior strait of the pelvis.*—Under this head we shall describe the application in the six positions of the vertex, which we have admitted, and in addition, the application in those cases in which the head remains in the transverse position.

In the occipito-pubic position, the occiput is placed behind the symphysis pubis, the forehead towards the sacrum, and the bi-parietal diameter corresponds to the transverse diameter of the pelvis. In this case, the male branch must be introduced first, and always to the left side of the pelvis. With one or two fingers of the right

hand, carefully introduced into the vagina, so as to separate the edges of the os uteri from the foetal head, the male branch must be seized as we hold a pen, and while the handle is held obliquely over the right groin, its blade must be introduced along the finger, towards the left sacro-iliac symphysis, (see fig. 36.) As the blade

Fig. 36.



is gently pushed up, its handle of course will be brought towards the median line of the body, and gradually depressed until it lies back against the perineum. The blade must now be brought forward along the sides of the head, and in this position it must be retained by an assistant.*

* Figure 36 not only represents the mode in which the male blade should be introduced into the left side of the pelvis, but demonstrates the necessity of always introducing the second blade above the first, viz., between it and the symphysis pubis. This will sometimes render it necessary, in locking the blades, to cross the handles; a movement which can be easily effected without deranging the position of the blades.

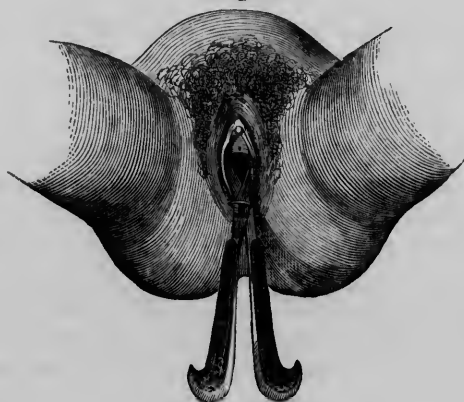
The introduction of the female branch may be effected in a precisely similar manner. (See fig. 37.)

Fig. 37.



The position of the forceps, when properly applied will be that

Fig. 38.



represented in fig. 38 and fig. 39,—the curved edge of the forceps being placed directly under the symphysis pubis, while the blade grasps the head in the direction of the occipito-mental diameter.

Fig. 39.



In this case, the head being at the inferior strait, our traction should be made in the direction of the axis of that strait, viz., downward and forward; but, so soon as the occiput is disengaged under the symphysis pubis, extension commences, and the line of traction should be gradually changed, so that at the termination of the delivery of the head, the handles of the forceps shall be drawn upward, towards the abdomen.

In the Occipito-sacral Position, the application is made in a way similar to the one just described. In this case, our first effort with the forceps, should be to raise the head

somewhat in the pelvis, and to flex it firmly, so as to allow the more easy delivery of the occiput over the posterior commissure of the perineum. When the occiput has been delivered, it will be necessary, if the pains are not sufficient, to change the direction of our traction, by drawing gently downward and backward, so as to allow the escape of the forehead, face, &c.

In the left Occipito-cotyloid Position.—In this position, the head is placed obliquely in the pelvis, but still it will be necessary to place the blades along the side of the head, which will of course give to the instrument when applied an oblique position as it regards the pelvis; its concave edge will look towards the left acetabulum, and one of the blades will be placed in the anterior, and the other in the posterior part of the pelvis. The branch which is to lie in the posterior part of the pelvis, and to the left side, must be introduced first; this will, of course, be the male branch. Its introduction may be effected, as has already been described, with this exception, that it will not be necessary to glide the blade

forward from its original position, in front of the sacro-sciatic ligaments. The female branch must also be introduced (of course being above the male) in front of the sacro-iliac symphysis, and when thus placed, its blade must be glided by the spiral movement to which we have before alluded, so as to rest its convex surface behind the right cotyloid cavity.

When the instrument is thus applied, it will easily lock, and our traction should be commenced in a line with the axis of the inferior strait, gradually, at the same time, rotating the occiput under the symphysis pubis, so as to bring the concave edge of the forceps under the pubic arch. The rest of the delivery is accomplished in the usual way.

In the right occipito-sacro-iliac position, the head is placed obliquely in the pelvis, and the occiput looks posteriorly, and to the right side. It is evident that in the application of the forceps, the same oblique position will be given to the instrument, and that the mode of applying the blades will be exactly similar to the one just described; (see fig. 40.) The same spiral movement, for placing the female blade somewhat anteriorly, must be executed, and at the proper time rotation of the forehead and not the occiput, towards the symphysis pubis, must not be forgotten; when this is done, the delivery is accomplished as described in the case of the occipito-sacral position.

In the right occipito-cotyloid position, the head being placed obliquely, the forceps will have a similar direction; but here the female branch, which will lie in the posterior part of the pelvis, and to the right side, must be first introduced. After this has been done, the male branch must be passed up in front of the left

Fig. 40.



sacro-iliac symphysis, when, by means of a spiral movement, it should be drawn forward, so as to have its convex surface nearly behind the left acetabulum. When thus applied, our traction should be made in the line of the axis of the inferior strait, at the same time that the occiput is, by a movement of rotation, brought under the pubic arch.

In the left occipito-sacro-iliac position, the head being placed obliquely in the direction of the right oblique pelvic diameter, the application of the forceps will be accomplished in the mode described for the right occipito-cotyloid position. The female branch will be introduced first and to the right side, while the male branch will be placed to the left posterior part of the pelvis, to be brought, by means of a spiral movement, towards the left cotyloid cavity. When thus applied the occiput must be rotated towards the coccyx, so that the delivery may be accomplished, as described for the occipito-sacral positions.

In the transverse position, where the occiput is to the *left* side of the pelvis.—In order that the forceps shall in this case be applied to the side of the head, the convex surface of one blade must be placed behind the symphysis pubis, while that of the other will offer to the sacrum. By some it has been recommended to apply the blades upon the forehead and occiput. This is probably best where the head is at the superior strait, and even in this case the attempt to lock the forceps, when thus applied, is often sufficient to rotate the head into a diagonal position, when the instrument may be properly applied; or if the head be drawn down to the floor of the perineum in this position, the natural efforts are sometimes sufficient to rotate the head and the instruments, so as to throw the occiput under the symphysis pubis.

But where the head has arrived at the inferior strait, it will be preferable to apply the instruments. But which blade must be first introduced? The rule is this, *let that blade be first introduced and placed posteriorly, the concave edge of which will, after the rotation of the occiput towards the symphysis pubis, offer under the pubic arch.* In the position represented in fig. 41, the male branch must be first introduced in front of the left sacro-iliac symphysis, and carried, (either by acting

upon the handle, or by pushing the blade with the finger already introduced into the vagina,) towards the hollow of the sacrum, so that its concave surface will grasp the left side of the foetal head. When this has been done, the female branch must be introduced into the right anterior part of the pelvis, and gradually carried to the symphysis pubis, so as to apply its concave surface to the right side of the child's head. The instruments must now be locked, and traction commenced, during which the rotation of the occiput towards the symphysis pubis should be effected, when the subsequent delivery will be accomplished in the usual manner.

In the transverse position, where the occiput is to the right side, the rule of application is the same as given for the other transverse position, hence the female branch will be first introduced into the posterior part of the pelvis, while the male branch must be so placed as to lie behind the symphysis pubis. The subsequent delivery must be effected as usual.

The application of the forceps after the head has become engaged in the pelvic brim is to be executed upon precisely the same principles as those already laid down, though it must be remembered that the difficulties are of course much greater than where the head has descended to the inferior strait. The following additional precautions will become necessary. 1st. To carry the whole hand into the vagina, for the purpose of serving as a director to the blade of the forceps; 2d. To push the blades much farther up into the pelvis; 3d. To make our traction at first correspond with the line of the axis of the upper part of the pelvic excavation.

The application of the forceps where the head is entirely above the brim of the pelvis.—The difficulties in this case are very great, and have been elsewhere fully explained, so that we need only repeat the rule we then laid down, viz., that if artificial delivery become necessary, while the head is at or above the superior strait, it will be best to resort to turning, where it is practicable, even though there be a slight contraction of the pelvic brim. If our efforts to turn should fail, the forceps may then be employed in preference to the perforator. The application of the forceps when the head is above the superior strait, should be limited as far as possible to those

eases in which the contraction of the brim has reached three or three and a half inches; where it is above this, turning must be resorted to if it be practicable.

Whatever be the position, (for this is not easily ascertained where the head rests above the brim,) the blades of the forceps must be applied in the usual way to the sides of the pelvis, and if possible to the sides of the head. When this has been done, moderate compression may be exerted, and our traction must be made from side to side, and in a line with the axis of the whole pelvis.

Where the head is transverse, and is seized in the direction of the occipito-frontal diameter, it may, as we have before said, become converted into a diagonal position. If this does not take place, the rotation should be effected at the proper time with the instrument.

The application of the forceps, where the face presents, may be called for as in vertex cases, where it is at the inferior strait, where it has entered the pelvic cavity, or where it is above the brim. The difficulties, in each of these cases, are always greatest when the presenting part is most elevated.

1st. *When the face has descended to the floor of the pelvis.*—This descent of course cannot take place while the fœtal head and the pelvis are of the ordinary size, unless the chin of the child looks directly, or nearly so, to the pubis. If, then, the forceps be determined upon in either of these cases, the mode of application will not differ from that recommended in vertex cases, remembering, that as it will always be necessary to turn the chin towards the pubis, the forceps should be so placed as to bring their concave edges under the arch of the pubis.

In the left mento-iliac position, the male branch will be first introduced, and must be placed posteriorly, so as to grasp the side of the head which lies posteriorly. After the male branch has been applied, the female is to be introduced, so as to lie anteriorly. In this case, as the face is drawn down, the chin must be turned under the symphysis pubis, which will, of course, bring the concave edge of the forceps under the pubic arch. The application,

in fact, is precisely similar to that in which the vertex lies transversely. (See fig. 41.)

If the right mento-iliac position occur, there will be no difference in the case, except that the female branch must be first used, and introduced into the posterior part of the pelvis.

In the mento-pubic position, there will be no difficulty.

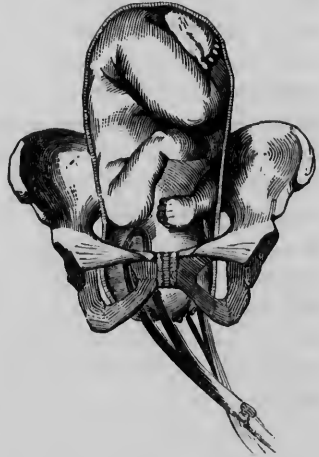
In some cases, the rotation of the chin is imperfect, so that it lies towards one or the other cotyloid cavity. If the chin point to the right acetabulum, the female branch must be first introduced into the posterior and right side of the pelvis, so that when the chin is rotated towards the pubis, the concave edge of the forceps will be directed under the pubic arch.

If, however, the chin point to the left acetabulum, the male blade will be first introduced, to the posterior and left part of the pelvis; while the female, introduced last, will lie behind the right acetabulum.

In all these cases, when the head has been seized, the chin must be rotated, so as to place it under the symphysis pubis. Our traction must be directed so as to allow the delivery of the chin from under the pubic arch, and when this has been accomplished, the handle of the forceps must be gradually elevated, so as to effect the passage of the forehead, occiput, &c., over the posterior commissure.

2d. *When the face has partly entered the pelvic brim, it may become necessary to employ the forceps. If the chin be placed at any point of the anterior half of the pelvis, the mode of applying the forceps will not differ from that just described, always remembering, that when the part is thus elevated, it will be necessary to*

Fig. 41.



introduce the whole hand, (which is intended to serve as a director to the blade of the forceps,) into the vagina, and that each blade will be required to be pushed up farther into the pelvis before the head can be properly grasped. If the chin be turned towards the posterior half of the pelvis, it will be best, when practicable, either to rectify the position, by converting it into one of the vertex, or to resort to turning. Where these means cannot be resorted to, the forceps must be applied, and every effort made, by gentle and gradual rotation, to bring the chin round towards the pubis. This is a most difficult point, since, if the body be firmly clasped by a contracted uterus, it will fail to rotate with the head, and the luxation of the neck of the child will result. Where the chin offers directly posteriorly, (the head and pelvis being of the ordinary size,) and the face has passed into the excavation, M. Cazeaux recommends to use the forceps, (of course neither rectification of the position nor turning can be resorted to in this case,) for the purpose, by properly directed tractive efforts, of drawing down the vertex. This would seem to us impossible, and in the case in point, where the lever and forceps fail to execute the movement just alluded to, the perforation of the head will be unavoidable.

When the face is movable, and entirely above the pelvic brim, either the rectification of the position or turning must be resorted to, and the forceps need only be thought of, when these are impracticable.

In pelvic presentations, it may become necessary, after the body of the child has been expelled, to apply the forceps, for the purpose of extracting the head. This application of the forceps is one of great difficulty, and has been recommended where the head was at the pelvic brim, or not descended to the inferior strait, or where it rested upon the pelvic floor.

In regard to the application of the forceps, where the head is remote from the inferior strait, we feel disposed to adopt the opinions of Dr. Dewees, who says : " It will be readily admitted, by all who have attempted the application of these instruments, with a view to relieve the head when the body was delivered, that it is attended with no inconsiderable difficulty, even in the most simple of the cases in which they may be required ; how much more, then,

when the head is remote from the inferior, and perhaps tightly wedged in the superior strait; in both of which cases the use of these instruments is recommended. I did not succeed in the two or three instances in which I employed them, under the circumstances described by Smellie and Baudelocque, and as represented by the former in his 35th, and by the latter in his 14th plate. I will not say that their application is impracticable because I failed; especially as both Smellie and Baudelocque declare they have succeeded; but there are several serious difficulties to oppose their application, which I will endeavour to point out: 1st. When the head of the child is at the superior strait, and engaged with its greatest length between the pubes and sacrum, or even when the forehead and vertex offer to the sides of the pelvis; as the axis of this strait is so much in advance of the inferior, that it seems almost impossible that the perineum could be pressed so far back, as to permit the forceps to correspond with it, that they may securely grasp the head. 2d. That if the head be even grasped by the forceps, it must be in the direction, or very nearly so, of the perpendicular diameter of the child's head, instead of the oblique; a circumstance of great consequence to the success of the operation. 3d. This advantageous position of the head for the use of these instruments, may lead to the belief that they are well placed, because their handles unite without difficulty; whereas, they but very partially embrace the head; and if an effort be made to extract, they will most probably slip, and the uterus, vagina, or bladder be severely injured."

In accordance with these views, we would limit the application of the forceps (in the cases where the body has been previously expelled) to those cases, in which the head has descended to the inferior strait of the pelvis.

When the occiput lies towards the anterior half of the pelvis, and the face towards its posterior half, the application of the forceps may be effected more easily than in any other position. In this case the body of the child should be carried over the mons veneris, as far as possible without injury to its neck. When thus supported by an assistant, the fingers of the right hand of the operator should be passed into the vagina, along the side of the

head, while with the left, the male branch of the instrument must be introduced, so as to clasp the side of the head, and this is best done by pressing the handles back against the posterior commissure of the perineum, at the same time elevating the blades to the proper point. The female branch must be applied in a similar manner. When the instrument has been locked, traction should be exerted in such a direction as to draw the face forward along the perineum, until the chin, face, forehead, and vertex are finally delivered.

In this application of the instrument, it will be observed, that the blades are insinuated between the perineum and the anterior face of the child's body.

If the occiput point towards the posterior half of the pelvis, the forceps are, according to Dr. Dewees, to be applied in a precisely similar manner, in which case it will be necessary to throw the posterior part of the body of the child back against the perineum, so as to permit the introduction of the blades between the symphysis pubis and the anterior face of the child's body. When this has been done, the traction should be made so as to draw successively the chin, face, forehead, and vertex from under the pubic arch.

Another plan would be to throw the anterior face of the child's body, close against the pubis, so that the forceps may be applied, by insinuating the blades, between the perineum and the back of the child. After having, in this way, applied the forceps, we must endeavour, by a forcible extension of the neck, to draw the occiput over the perineum, when the forehead and face will soon follow. This is the easiest mode of application, but it is objectionable because of the injury which the forcible extension of the neck would inflict upon the child.

In a number of cases, the application of the forceps is called for, owing to the arrest of the head at the perineum. This arrest of the head is due to the inability of the expulsive efforts to overcome the resistance offered by the muscles constituting the female perineum. In some cases, the labour-pains, having succeeded in forcing the head down upon the perineum, suddenly cease, and of course no farther advance is made in the delivery. In this case, the proper mode of action is to use every effort in inducing a renewal of the

pains, such as frictions over the abdomen, the administration of ergot, &c. Should these efforts fail, a resort to the forceps will become necessary; remembering always that these instruments should never be employed, till we are certain that the labour cannot be finished by the natural efforts, or until the arrest of the head upon the perineum threatens some injury to the mother or child.

In other instances, though the uterine efforts continue strong and forcible, still the head makes no progress, owing to the great resistance offered by the perineum. In this case, it would be clearly wrong to resort to those means calculated to increase the uterine pains, for fear a rupture of the uterus might result. The treatment in this case, will consist in the free abstraction of blood, for the purpose of diminishing the resistance of the perineum, and if this fails, the forceps must be resorted to.

The use of the forceps has been recommended by some, in irregular presentations, as of the forehead, the side of the head, &c. These cases frequently, as we have already seen, become converted into direct vertex or face presentations, and where this fails, as well as the manual attempt at rectification, we would prefer the use of the lever or of one blade of the forceps, for the purpose of reducing the position to one more favourable. If our efforts should not succeed with this instrument, the forceps may be employed. Their mode of application in these cases, will be governed by the peculiar exigencies of the case, though in principle, their application must be made in accordance with the rules already laid down.

Before concluding this chapter upon the use of the forceps, we must advert to the treatment of what has been termed *locked* or *impacted head*. This arrest of the head, according to Baudelocque, only occurs where the fœtal head becomes fixed within the pelvis, by two points of its surface, diametrically opposite to each other. This species of locked head he divided into two varieties: 1st. Where the head is jammed with its greatest length between the pubis and sacrum. 2d. Where its thickness cannot pass, owing to a contraction of the antero-posterior diameter of the pelvis. In the first variety the occiput and forehead are in con-

tact with the inner surface of the pelvis, while in the second it is the parietal protuberances.

If these be the only varieties of impacted head, it is plain that the treatment in the first will consist in its manual rectification, if possible. When this does not succeed, the forceps should be employed. Their application in this case presents no peculiar difficulties; but if we should fail in effecting the delivery, the perforation of the head will become necessary. In the second variety the forceps may be employed also, and if the pelvic contraction be too great to admit the extraction of the head, our only resource will be the perforator.

But we do not admit that these are the only varieties of impaction which may occur, since it is certain that the head may become so jammed into the pelvic excavation, as to prevent its farther advance, at the same time, that there will not exist sufficient space between any point of the circumference of the foetal head and that of the pelvis, for the insinuation of the blades of the forceps, the more especially, if there be swelling and inflammation of the soft parts lining the pelvis. This accident, may be due, not to any malposition, as is supposed in the first variety of Baudelocque, but to a contracted pelvis or an unusually developed head.

Before proceeding farther in this matter, it will be proper to explain the difference between *arrest* and *impaction*. By the former, we mean the case in which the head ceases to advance on account of a slight pelvic contraction, not so great as to prevent the delivery of a living child. In this case, the head, though arrested, may be pushed upward, when the finger may be insinuated between its circumference and that of the pelvis, so as probably to enable us to feel the ear.

The term *impaction*, is employed in a different sense: it implies that the head is *locked*, ceases to advance, nor can it be displaced upward, except with the greatest difficulty. In this case, the parietal bones are overlapped, the scalp swollen, the soft parts, contained within the pelvis, are greatly compressed, and the urethra ceases to give passage to the urine, unless by the introduction of the catheter, which is frequently rendered impossible. If the

finger be introduced into the vagina, it cannot be insinuated between the head and pelvis, nor can the ear be felt. This impaction of the child's head is due to pelvic deformity, or to an unusually developed foetal head.

In those cases in which an arrest of the head has existed for a short time only, owing in part to feebleness, or suspension of the uterine pains, no interference will be required until we are convinced that the delivery cannot be accomplished by the natural efforts, which should be excited by the ordinary means. When the pains are powerful, though unable to advance the head, or where they remain feeble or suspended, the forceps must be resorted to, provided the head has been arrested for the space of six hours, or even before this, if symptoms of exhaustion or inflammation arise. Where the forceps are not successful, the head must be perforated.

When the head is impacted or locked, so that its displacement upwards is impossible, our course of management should be entirely different, since the forceps cannot be applied, on account of a want of space between the head and the pelvis, without inflicting serious injury upon the mother, or if this application be possible, the compression of the head in extraction would be so great as to destroy the child, at the same time that the death of the mother would be rendered exceedingly probable. Where the impaction has existed for several hours, the swelling of the parts adds greatly to the difficulty.

If the forceps cannot be employed with safety to the mother, the perforator is our last resort. Nor does this operation necessarily imply that we are to destroy the life of the child, since in a majority of these cases the *fœtus* is already dead, and if it were not, we have no right to endanger the life of the mother for the purpose of saving that of the child. Formerly, our means of ascertaining the condition of the *fœtus* were limited, and it was customary to wait until signs of putrescency, such as looseness of the bones of the head, &c., had occurred, when if the delivery could not be accomplished by the natural efforts, the perforator was to be used. This unseasonable and dangerous delay is the chief reason why perforation has proved so fatal to the mother,

for the length of time required to putrefy the dead fœtus would assuredly be sufficient to induce inflammation, gangrene, &c., of the soft parts of the mother.

When the waters are evacuated, and the head has been lodged or impacted in the pelvis for some time, the death of the child usually takes place before perforation has been determined upon. But have we no other means of ascertaining the death of the fœtus besides its putrescency? Most certainly, the auscultation of the fœtal heart is a certain guide, and its pulsations are the more easily detected in the case in point, since the waters having been long evacuated, the contracted uterus applies itself accurately over the body of the child, so that the sound is conveyed immediately to the ear, without first traversing the mass of amniotic fluid by which it is surrounded during pregnancy and the early part of labour. On this point Dr. Collins says: "I have no difficulty in stating, *and that after the most anxious and minute attention to this point*, that where the patient has been properly treated from the commencement of her labour, where strict attention has been paid to keep her cool and her mind easy, where stimulants of all kinds have been prohibited, and the necessary attention paid to the state of her bowels and bladder, that under such management the death of the child takes place in laborious and difficult labour, before the symptoms become so alarming as to cause any experienced physician to lessen the head. This is a fact I have ascertained beyond all doubt by means of the stethoscope, the use of which has exhibited to me the great errors I committed before I was acquainted with its application to midwifery, viz., in delaying delivery often, I have no doubt, so as to render the result precarious in the extreme, and in some cases were fatal." It would therefore seem that in impaction of the head, where it can be moved neither upward nor downward, the application of the forceps, even if possible, would be unadvisable on account of the danger of inflicting injury upon the soft parts of the mother. Our only alternative then, in these cases, is perforation, not to be resorted to if the child lives, until danger to the mother is to be apprehended; but where the pulsations of the fœtal heart cease, the sooner perforation, in cases of impaction, is performed, the better. By acting

in accordance with this rule the mortality to the mother is greatly diminished, while at the same time, the terrible responsibility of murdering the child is but rarely incurred.

If dangerous symptoms to the mother should arise before the death of the child has taken place, no hesitation should exist in regard to the perforation of the head, since it must be remembered that though the life of the child be precious, still its preservation is nothing when compared with that of the mother; to insure its safety no risk to the mother should be run, but for her preservation everything should be sacrificed. Any other moral principle of action is inadmissible, and should be frowned down, no matter whence such doctrines emanate.

The Lever.—This is a very simple instrument, resembling *one* blade of the forceps, and is used as a lever of the first kind, the left hand of the operator forming its fulcrum. The lever is used principally for the purpose of correcting malposition of the vertex; in every other case, calling for instrumental delivery, we would prefer the use of the forceps.

CHAPTER XVIII.

SECTION I. *Craniotomy*.—This is the next obstetrical operation for our consideration. This operation, which necessarily implies the destruction of the life of the child, is resorted to for the purpose of saving the mother, if possible, in those extreme cases where neither version nor the application of the forceps are practicable. It has been asserted, in a previous chapter, that we should not heedlessly destroy the child's life, but that, at the same time, the safety of the mother must be considered of paramount importance, and where called upon to decide a question involving such importance, we should not hesitate to sacrifice the life of the child to the safety of the mother. It is this principle which is involved, in determining upon the propriety of resorting to craniotomy, or the perforation of the child's head. This operation is only to be resorted to when version, or the use of the forceps, are impracticable, and when, if the case were left to the natural efforts, it would inevitably result in the death of both mother and child.

When speaking of the propriety of using the forceps, it was stated that these instruments could not be successfully employed in extracting a full-grown fœtus, where the small diameter of the pelvis was reduced to three inches or thereabouts. Delivery can only be effected, in such cases, in two ways: 1st, by perforating the fœtal head, for the purpose of lessening its size. 2d, by performing the Cæsarian section. According to the first plan, the life of the child is inevitably destroyed, but four mothers in five are saved, but by the Cæsarian operation it appears that the mortality to the mother is one in two and a quarter, to the child one in three and one third. In view of these statistical results, what accoucheur would hesitate to resort to perforation in preference to the Cæsarian section? But we will see hereafter, that where these extreme cases of pelvic deformities are ascertained at an early period of preg-

nancy, we possess another means of delivery, much less destructive to the life of the mother, and in some cases affording some chance of saving the child. At present, we suppose that actual labour exists, and that, owing to difficulties of an extreme character, either craniotomy or the Cæsarian section are demanded. In this alternative, we should not hesitate to choose the former, since it affords greater chances of safety to the mother than the latter. Nor in this case, are we always obliged to murder the child, since in many of these difficult labours, life is already extinct. The degree of pelvic contraction which demands a resort to perforation, is not exactly determined. On this point obstetricians differ somewhat; thus, Dr. Osborn fixes upon two and three quarter inches, in the small diameter, as rendering craniotomy necessary, while others of equal authority state, that the operation is demanded, whenever this diameter has been reduced below three and a quarter inches. The difference of opinion here is considerable, but is probably due to the fact, that the rule laid down varies with the varying size of the foetal head, and with the different amount of ingenuity possessed by accoucheurs, in the use of the forceps. The following rule we think sufficiently accurate for all practical purposes, to wit, where the small diameter of the pelvis measures a little over three inches, it will be possible, with the forceps, to extract the foetal head, of ordinary size; but when this attempt fails, the operation of craniotomy will be required.

But there is a point of pelvic contraction beyond which the foetal head, even after mutilation, cannot be extracted. Now what is this point? Dr. Osborn says, "Whenever there is a space from pubis to sacrum, or from the fore to the hind part of the upper aperture of the pelvis, equal to an inch and a half, I am convinced it will be always practicable to extract a child by the crotchet, after the head has been some time opened, and the texture of the child's body is softened by putrefaction, and the whole of the parietal and frontal bones are picked away." On the other hand, Baudelocque says, the operation is inadmissible, where the diameter measures only $1\frac{2}{3}$ of an inch; and Dewees, where it is two inches. We think the limit given by Baudelocque is probably the

proper one, though the positive rule may be varied by many circumstances.

The rule we would lay down is this, whenever the small diameter of the brim of the pelvis is contracted to about three inches, the forceps are inadmissible, and perforation must be performed; but where this diameter is reduced below one and two-thirds of an inch, the extraction of the child, even after perforation, is impossible; and in this case we will presently see that our only resource is the Cæsarian section.

What are the circumstances under which we would be justifiable in resorting to an operation so repugnant to our humane feelings? 1st, The continuance of strong labour pains, without any advance of the head, indicate that some serious obstacle to the delivery exists, and we should endeavour, by an examination per vaginam, to ascertain the nature and the extent of the deformity. Where this cannot be accurately determined, delivery with the forceps, or by version, should be attempted, and where these have failed, our next resource will be the perforation of the head. 2d. The condition of the soft parts, and of the patient's strength, must guide our conduct; if the debility be great, if fever exist, if the soft parts are red, swollen, and undilated, it will be best to resort immediately to the perforation of the head, since any further delay would prove destructive to the mother. 3d. Where the child is dead, we will have much less difficulty in deciding upon our course, and if, in this case, or even where the child is living, the pelvic contraction be such as to render the use of the forceps impracticable, the sooner craniotomy is performed, the greater will be the chance of saving the mother. 4th. The pelvis may be deformed by the existence of exostoses, ovarian tumours, &c., to such an extent as to prevent the delivery of the child in an unmutilated condition. In some cases, the nature of the tumour may be such, as to admit of puncturing for the purpose of evacuating its contents, when delivery may be accomplished without farther difficulty. 5th. Craniotomy may be required, when the foetal head is hydrocephalic to such an extent, as to prevent its passage through the excavation. 6th. Where the arm presents along with the head, craniotomy may be required, when the con-

dition of things cannot be rectified, and where delivery with the forceps cannot be effected. 7th. In breech presentations, where the head, either separated or not from the body, cannot be extracted, we must resort to the perforation of the child's head. 8th. In some irregular presentations of the vertex, (as when the forehead, &c., may present,) craniotomy may be required after our attempts at rectification or delivery with the forceps have failed.

In order to perform the operation of craniotomy, the accoucheur must be supplied with a pair of scissors, with shoulder-stops, and an external cutting edge. In introducing this instrument, it is not necessary that the os uteri should be fully dilated, though the procedure would be much more easily and safely accomplished, if the parts were in a state of complete dilatation. Before operating, the rectum and bladder should be emptied of their contents. The female should be placed upon her back or side, and an assistant being directed to steady the fundus uteri, the scissors (or perforator) well greased, must be seized in the right hand, and passed along the two fingers of the left hand previously introduced to the point where we wish to perforate the head. The point of the instrument is to be pressed through the cranial bones by a semi-rotatory motion, and when inserted as far as the shoulder stops, the handles of the scissors are to be separated for the purpose of making an incision as wide as possible. When this is done, another incision should be made at right angles to the first, and then the instrument should be passed into the cranial cavity for the purpose of breaking up completely the cerebral texture. This last part of the operation should be performed thoroughly, so as to destroy the life of the child completely.

The crotchet must now be introduced into the cranium, for the purpose of hooking its sharp point against the internal surface of the cranial bones, so as to enable us to extract the head, which, when pressed upon, expels its whole contents into the vagina. When the crotchet is firmly hooked upon the bone, it will be well to guard against any chance of its slipping and injuring the maternal soft parts, by placing the two fingers of the left hand over

a point on the exterior of the scalp, opposite to that occupied by the sharp point of the crotchet.

In this way the mutilated head may be extracted from the pelvis; but on some occasions it will be necessary to take these bones away, piecemeal, either with the crotchet or a pair of craniotomy forceps.

The whole of this operation must be executed with careful gentleness, since the great danger to the mother arises from injury to the soft parts, caused by the slipping of the instrument, the rough edges of the bones, &c.

The body of the child will sometimes follow without farther mutilation; if it should not, however, the thorax and abdomen must be successively evacuated of their contents, and extracted as each case may require.

The subsequent inflammation in these cases, must be treated on general principles.

SECTION II. *The Cæsarian Section, or Hysterotomy.*—This is an operation which is resorted to, where, during labour, we cannot successfully employ the forceps or perforator; hence it must be regarded as our last resource in effecting delivery. In our remarks upon the use of the perforator, we stated that, when the small diameter of the inferior strait measured less than $1\frac{1}{2}$ or $1\frac{2}{3}$ inches, that the child, though mutilated, could not be extracted, and it is this degree of contraction which calls for the Cæsarian section. In this operation, neither the life of the mother nor that of the child are *necessarily* destroyed, but at the same time, it must be remembered, that the mortality to the mother is much greater than when the perforator is used; in the former, one in about two and a half perish, while in the latter, four mothers in five are saved, and this difference in the degree of mortality, forms a sufficient reason for the preference of the operation of craniotomy to that of hysterotomy, notwithstanding that the life of the child is inevitably destroyed in the one case, whereas it may be saved in the other.

The objects in resorting to this operation of hysterotomy are, 1st, To effect the delivery with safety to both mother and child, in those cases, where the forceps, the perforator, and premature deli-

very are inapplicable. 2d. To effect the extraction of a living child, where the death of the mother has taken place suddenly.

The operation in the Cæsarian section, consists in an incision made through the abdominal and uterine parietes, sufficiently large to permit of our extracting the whole uterine contents. After this has been effected, the uterus contracts, and very nearly closes the incision made through its tissues. The external incision, after sponging all the blood from the abdominal cavity, and replacing the intestines, must be brought together by means of sutures and sticking plaster. The after treatment is to be conducted upon general principles.

This operation, though simple, is, as we have already seen, exceedingly dangerous to the mother, and the danger arises from the subsequent inflammation of the tissues involved, and from the occurrence of hemorrhage from the wound made in the uterus. The former is of common occurrence, while the latter occurs much less frequently than was formerly supposed.

This operation should be performed as soon after the commencement of labour as possible, because, at that time, the strength of the female being unimpaired, she is much more capable of supporting an operation so serious in its character.

SECTION III. *Symphyseotomy*.—This operation is now rarely, if ever, resorted to, and consists in an incision through the symphysis pubis, for the purpose of enlarging the antero-posterior diameter of the pelvis. It is more fatal to the child than the Cæsarian section, and though not quite so much so to the mother, yet those who recover are liable to accidents of so serious a nature, as to more than counterbalance this very slight advantage.

The objections to this operation are numerous: 1st, in extreme contractions we do not gain sufficient room to deliver the child per vias naturales, and it is only in these cases, where the Cæsarian section is called for, that symphyseotomy is admissible, because, when compared with the operation of craniotomy, the dangers to the life of the mother are much increased. 2d. The incision of the symphysis pubis may fail to unite, in which case the mother would be left in a wretched condition. 3d. The danger of wounding the bladder, &c., are very great, and are followed by inconveniences of a very disagreeable character.

CHAPTER XIX.

Induction of premature delivery.—This operation has been advised in those cases in which it is known that the fully developed fœtus would be unable, on account of pelvic deformity, to pass through the pelvis either spontaneously, or by the aid of the forceps. The object of this operation is to save the life of the child, and spare the mother the accidents incident to perforation, by inducing labour as soon as the child has become viable.

The induction of premature delivery is to be distinguished from forced delivery, for as Ritzen remarks, “in premature delivery, nature accomplishes nearly every thing, and art only communicates to it a slight but certain impulse, whilst in forced delivery *art* acts almost entirely ;” our only interference consists in the induction of uterine contraction, when the subsequent delivery is left entirely to the natural efforts.

This operation originated with the British practitioners, and in 1756 there was a consultation of the most eminent men at that time in London, “to consider the moral rectitude of, and the advantages which might be expected from this practice, which met with their general approbation.” Owing to this decision, the operation was successfully performed by Dr. Macauley, and, at the present day, it is considered by the English and American practitioners as a perfectly justifiable procedure. Not so among the French, by whom it has been, with few exceptions, denounced as immoral and injudicious. Notwithstanding, however, this opposition, emanating principally from Baudelocque and his pupils, Fodère persisted in recommending it, and in 1830 M. Burchardt, in his thesis, maintained the legitimacy of the operation. Prof. Stoltz, in 1834, was the first to perform this operation with entire success ; since then, it has been approved of by Dezeimeris, Dubois, Ferniot, Lacour, Cazeaux, &c.

The objections urged against this operation are very numerous, and may be stated as follows:

1st. It is objectionable in a moral point of view.

2d. It is almost impossible to determine with exactness the relative proportion between the pelvis of the mother and the head of the fœtus.

3d. The means necessary to induce labour are calculated to injure the mother.

4th. The duration of pregnancy cannot always be ascertained.

5th. The difficulty in bringing about the dilatation of the os uteri is always very great.

6th. Premature delivery is apt to be followed by disease.

In answer to these objections it may be said, 1st. That no immorality can attach to this operation, since its intention is to save the life of the child by substituting for the perforator, the safe delivery of a living child, in all those cases, in which the accoucheur is unable to extract with the forceps. The use of the perforator necessarily implies the destruction of the child's life, and it is to this murderous instrument we must resort in case of failure with the forceps, unless we admit the propriety of inducing premature delivery of a viable child. That the child is viable at seven months cannot be doubted from the evidence presented in our chapter on the term of utero-gestation. But farther, its delivery at this period may be effected with comparative safety, since it is found that of those delivered in this way more than half are saved, notwithstanding the fact that in premature deliveries the malposition of the fœtus is more frequent than in labour at full term. Intended then only as a substitute for the perforator, it is perfectly evident that premature delivery is justified upon strictly moral principles, since by it an immense saving of human life is effected, and that, with but little risk to the mother.

2d. It is said to be impossible to determine the exact size of the pelvis of the mother, or of the head of the child. This is no doubt a difficulty, but we think for all practical purposes we may come to a proper determination of these points. The examination of the pelvis should be accurately made in the various ways heretofore pointed out, and we will see presently that the probable size

of the head at the different periods of pregnancy may also be ascertained. But farther, if our estimate of the size of the head and pelvis should prove inaccurate, it will in reality make but little difference, for as Velpeau observes, "If the pelvis be wider than we thought, premature delivery, (at or after the seventh month,) is accomplished without risk. If, on the contrary, the narrowing be more considerable, the fœtus will certainly perish; but then had no operation been attempted till the full term, the fœtus would equally have been lost, and the mother would have run greater risk." In cases of distortion the induction of premature labour would not be resorted to until it has been proved by previous labours that the child cannot be delivered without lessening by perforation the size of its head.

3d. The means employed in effecting premature delivery are not so dangerous to the mother as where the perforator is employed. In cases of craniotomy the mortality to the mother is about one in five. Velpeau gives the results in 161 cases of premature delivery, and out of this number only eight died; five of them perished from causes unconnected with parturition. In 280 cases collected by Figueira, only six died. Thus the total number of cases collected by these two physicians amounts to 441, out of which only nine died from the effects of the operation, or one in about fifty.

From these facts we may conclude that the induction of premature labour is not near so fatal to the mother as the operation of craniotomy.

4th. The difficulty in establishing the duration of pregnancy, cannot form a valid objection to the performance of this operation, for if we are even mistaken in the calculation, it can only necessitate subsequent perforation, without any additional risk to the mother. Dr. Churchill thinks that this difficulty "may always be obviated in practice by assuming the longest possible period of pregnancy. If, for example, a patient imagines that she is six months pregnant, but that she may be six and a half, by calculating for the six and a half months, we shall have assumed the largest size to which the fœtal head can have attained; and if

labour be not brought on till seven months and a half, we shall also have secured a fœtus of the "*viable* age."

As it regards the size of the fœtal head, at the different periods of pregnancy, the following approximative results have been given by M. Figueira.

Age of the Fœtus.	Bi-parietal Diameter.	Occipito-frontal Diameter.	Occipito-bregmatic Diameter.
	Inches. Lines.	Inches. Lines.	Inches. Lines.
7th month, -	2 9	3 8	2 10
7½ " -	3	3 9	3
8th " -	3 1	3 10	3 1
8½ " -	3 2	4	3 2
9th " -	3 4	4	3 4

To this table Ritgen has added another of some practical importance: thus premature labour may be induced at the

	Inches. Lines.
29th week, when the antero-posterior diameter of the pelvis is	2 7
30th " " "	2 8
31st " " "	2 9
35th " " "	2 10
36th " " "	2 11
37th " " "	3 0

5th. We shall see hereafter that "the difficulty in bringing about the dilatation of the os uteri" forms no serious objection to this operation, and that it may be effected without injury to the part or danger to the mother.

6th. That premature delivery is not apt, if the operation be performed carefully, to be followed by disease, is the opinion of almost all those practitioners, who have had occasion to practise the operation.*

Having now given the objections which have been urged against this operation, as well as our reasons for resorting to the operation in preference to perforation, we will pass to the consideration of

* The statistical results given in the text are taken from "Churchill's System of Midwifery," edited by Prof. R. M. Huston.

the cases which call for the operation, and the mode in which it should be performed.

What condition of things calls for the induction of premature labour? When treating of the application of the forceps, it was stated that when the small diameter of the superior strait, was less than three inches, these instruments could not be employed, since it would be unsafe, if not impossible, to attempt to draw the full-grown head through an aperture so narrow, unless the head was exceedingly soft and yielding. In such cases, it would be advisable to adopt some other plan of delivery, consistent with the safety of both mother and child, and the only one, which presents itself, is the induction of premature delivery. As a general rule this operation must not be resorted to until the child is viable, which usually occurs at the end of seven months—though in some exceptional cases it takes place somewhat earlier.

When the small diameter of the superior strait is less than three inches in length, the head of the full-grown foetus cannot be delivered, but by reference to the table of M. Figueira, it will be seen that the foetal head at seven months measures not quite three inches, and consequently its passage through a pelvis contracted to less than three inches, may be accomplished without difficulty. On the other hand, if the small diameter of the superior strait measure less than $2\frac{1}{2}$ inches, the passage of the foetal head at seven months will be impossible. We may conclude then that where the contraction ranges between $2\frac{1}{2}$ and 3 inches, premature delivery may be effected; that where it exceeds three inches, the forceps may be employed; but where it is reduced below $2\frac{1}{2}$ inches, the delivery of the child at seven months will be impossible. In this latter case it will become a question, whether, from the fact that the child may be viable at an earlier period than seven months, we would not be justifiable in inducing labour, even before the pregnancy had reached its seventh month.

In primiparæ, where the degree of distortion is not previously ascertained, a resort to the induction of premature delivery would be improper; but where this difficulty does not exist, there is no reason why the operation should not be performed. In these

cases the closed condition of the os uteri will render the manœuvre more difficult but not impossible.

In cases of twins, the size of the foetus is somewhat less than where single pregnancy exists, hence the operation which would be demanded in the last case might be dispensed with in the first. This rule might guide us, if the existence of twins could be predetermined with accuracy, but we have seen elsewhere that it is exceedingly difficult to diagnosticate multiple pregnancies, and therefore the rule will rarely serve any practical purpose.

Where malposition of the foetus exists, as is frequently the case, every attempt should be made to rectify it, as well by internal as external manipulation.

But it is not only in cases of pelvic contraction, that this operation is called for,—where the patient suffers excessively, from any of the numerous diseases incident to pregnancy, this operation may become justifiable. Thus if the stomach be so irritable as to prevent the retention of food, the life of the female might be compromised unless premature delivery were induced. Merriman relates the following case, illustrative of this point. A female “was teased with a severe cough, and her stomach was so irritable as to retain no food whatever, nor even opium in the solid form. She had taken absorbents, stomachics, bitters, aromatics, and opiates without experiencing any relief; liniments, fomentations, and blisters had been extensively applied without benefit, and she was thought to be sinking into her grave, when it was proposed as a last resource, to bring on premature labour six weeks before the full time, and the patient was delivered of a living child and ultimately recovered.” Similar cases have been recorded by other writers, so that we are warranted in concluding that where these affections threaten the life of the mother, the induction of premature labour becomes justifiable.

In dangerous diseases of the heart, or of the lungs; in cases of aneurism; in excessive serous effusions; in convulsions; this operation may become necessary, so soon as the life of the mother is endangered.

In cases of uterine hemorrhage, before the full term of utero-gestation has been accomplished, the induction of premature delivery

may be resorted to, provided the flooding threaten the life of the mother.

If the pelvic cavity be blocked up by exostoses or fibrous tumours of the pelvis, premature labour may be induced at the end of seven months, provided sufficient space be left for the transmission of the head at this period.

The operation may also be resorted to, when a tumour, existing in the abdomen, prevents the developement of the uterus, or exposes it to dangerous pressure, thus inducing inflammation and its consequences.

Such are the causes which would seem to justify a resort to the induction of premature delivery ; but before leaving the subject, we will make the following extract from the work of Denman ; he says : " There is another situation in which I have proposed and tried with success, the method of bringing on premature labour. Some women who readily conceive, proceed regularly in their pregnancy, until they approach their full period, when, without any apparently adequate cause, they have been repeatedly seized with rigor, and the child has instantly died, though it may not have been expelled for some weeks after. In two cases of this kind, I have proposed to bring on premature labour when I was certain the child was living, and have succeeded in preserving the life of the children without hazard to the mother. There is always something of doubt in these cases, whether the child might not have been preserved without the operation ; but as such cases often come under consideration, and as I am disclosing all that my experience has taught me, it seemed necessary to mention this circumstance."

How is premature labour to be induced ? The mode of operating in these cases is various, and we will proceed to point out the different plans proposed.

Copious venesection, warm pediluvia, drastic purgatives, sometimes induce a premature discharge of the ovum from the uterus, but these are too uncertain and too slow in their action to be relied upon as a means of bringing on premature delivery, when this operation is demanded by any of the causes to which we have already alluded.

Another means of inducing premature delivery, consists in frictions over the fundus uteri for the purpose of exciting uterine contractions, at the same time that the os uteri is irritated with the finger. These efforts are not always capable of exciting the contractions of the uterus, and when they succeed, the effect is too transient and slight to produce the delivery of the fœtus.

The perforation of the membranes so as to discharge the waters, will sooner or later produce uterine contraction sufficient to effect the delivery of the child. This was the mode adopted by Macaulay and others, but to it there are some objections. Though this method of operating is neither painful nor injurious to the mother, yet the effects upon the fœtus when prematurely delivered in this way, is not as harmless as could be desired, for the following reasons: in the first place, after the discharge of the waters, from twelve to sixty hours may elapse before labour pains commence; and during the whole of this time the child is so pressed upon by the firmly-contracted organ, as to endanger its life. But in addition to this prolonged difficulty, we have another, viz., the slowness with which the cervix uteri (which at the end of the seventh month of pregnancy is not at all effaced) becomes dilated sufficiently to allow the delivery of the fœtus. The effacement of the cervix, and the dilatation of the os uteri, under these circumstances will require from twenty-four to forty-eight hours; and while these changes are in progress, it must be remembered that the child's body is subjected to undue pressure, and there is danger, lest the placenta become detached, some time before delivery is effected. These difficulties, from the tediousness of the process, form a great objection to this mode of delivery, at least as far as the safety of the child is concerned. The operation may be performed with a female catheter, or a canula armed with a trocar. The female is to be placed in the proper position, when the instrument used is to be introduced into the os uteri, and the membranes perforated.

Another means of inducing premature delivery, is that proposed by Hamilton. It consists in separating the membranes for two or three inches around the os uteri, either with the finger or a gum-elastic catheter. If this mode can be relied upon, it may be regarded as safe to both mother and child.

M. Meissner, of Leipsic, has proposed a new method of perforating the membranes, the object of which is, to avoid the long-continued pressure upon the body of the child, which the sudden evacuation of the waters necessarily occasions. This is accomplished by using a long curved canula, having concealed within it a spring trocar. The female is placed in the erect position, and the canula is carefully introduced through the os uteri, and as far up into the cavity of the uterus as possible. When this is done, the trocar is pushed out so as to pierce the membranes. In this case the waters are gradually discharged, so that during the time which elapses between the operation and the commencement of labour, much of the pressure upon the body of the child is avoided. M. Meissner has tried this mode of operating fourteen times, and in every case both mother and child have been saved. Though the experience, in regard to this operation, is not very extensive, still we are disposed to prefer it to either of the methods above mentioned.

Another mode of operating has been proposed by Kluge, by which the perforation of the membranes and the discharge of the waters is dispensed with. In this point of view, it offers great advantages over every other plan; but farther observations are required to prove its successful induction of uterine contractions. The mode of operating is as follows: a few days previous to the operation, the patient is required to use the warm bath and warm emollient vaginal injections. Before commencing, the bladder and rectum are to be emptied, and the female placed in the same position as if the forceps were to be applied. A conical plug of nice soft sponge, two inches long and half an inch in diameter, having a piece of tape attached to it, must be seized by a long curved pair of forceps, and passed along the finger, previously introduced as far as the os uteri, into the cervix uteri. When this has been done, the forceps must be withdrawn. The vagina must now be filled with another piece of sponge, and the whole retained in situ, by means of a perineal pad. As the sponge introduced into the cervix becomes saturated with the discharge of mucus from the vagina, &c., it enlarges, and of course dilates the os uteri, and by irritating its fibres, produces, by reaction upon those of the body

of the uterus, a contraction of the whole organ. If this effect is not actively excited, a larger piece of sponge must be introduced in the same way, after having withdrawn the first by means of the tape which was attached to it. This second introduction is not often necessary, for the uterine contractions are usually roused in the course of five or six hours. The labour pains must be increased, if necessary, by frictions over the abdomen, by titillating the os uteri, and by the use of the *secale cornutum*. This plan certainly is preferable, since it avoids the dangerous pressure upon the child, which the perforation of the membranes necessarily induces.

But suppose the distortion of the pelvis be such as to have diminished its small diameter below two and a half inches, would we be justifiable in inducing abortion? Abortion usually presupposes the non-viable condition of the child; hence in this case the life of the child will be out of the question, and it is only in regard to the safety of the mother that our decision should be made. If abortion be not morally justifiable, our only resource will be either perforation or the Cæsarian section; in the one the child's life is unavoidably destroyed, in the other it may be saved. As it regards perforation, the question we think is easily settled, since both in abortion and perforation the child is delivered dead, whereas in the former the dangers to the mother are infinitely less than in cases where the perforator is used. Our duty here is plain: choose that plan which is least injurious to the mother, for in either case the infant's life is necessarily destroyed. It does not, however, follow that the life of the child is never saved where labour has been induced previous to the end of the seventh month, for as has been heretofore shown, the child may be born alive before this time. The induction of abortion then, in cases of extreme contraction, is preferable to perforation. But how is it as it regards the Cæsarian section? In this the child's life is saved about once in three; in abortion, for argument's sake, we will say the child is always born dead. In the Cæsarian section one mother in two and a quarter is saved, while in abortion the mortality is much less, say one in fifty. Now this question presents itself: shall we, for the sake of saving one child in three,

run the risk of killing one mother in two, when we might save forty-nine out of fifty mothers by inducing abortion, with very little increase in the loss of the children? Can any one compare in importance the life of the infant with that of the mother? Will society sanction such a comparison? Would the husband decide otherwise than in favour of that operation which would most likely insure the safety of his wife, regardless of the unborn child? And in view of this universal verdict, shall medical men adopt a counter-opinion? On this point I will quote the language of Velpeau, who says, "As regards myself, I avow I cannot put in comparison the precious life of a *foetus* of three, four, five, or six months, a being scarcely differing from a plant, one that is bound by no ties to the external world, with that of the adult woman, whom a thousand social relations interest us to save; therefore, in a case of extreme narrowness of the pelvis, and where it was mathematically demonstrated that delivery at the full period was impossible, I would not hesitate to recommend producing abortion in the first months of gestation." This is the true, the humane, the moral view to be taken of this case, and we avow our preference, in extreme pelvic contraction, for the production of abortion over either perforation or the Cæsarian section.

CHAPTER XX.

Abortion.—If the contents of the gravid uterus be discharged before the fœtus is capable of maintaining an independent existence, *abortion* is said to have taken place. The time at which the child is *viable*, or capable of maintaining an existence independent of its connexion with the uterus, is not precisely fixed. By reference to the chapter on utero-gestation, it will be seen that the fœtus is usually not viable until the end of the sixth month of pregnancy, but that in some rare cases of undoubted authority, the fœtus has been born in a viable condition as early as the twenty-fifth or twenty-sixth week. Notwithstanding the existence of these exceptional cases, we may consider all expulsion of the contents of the gravid uterus, previous to the end of the sixth month, as cases of abortion, and where the delivery occurs subsequently to this period, it is to be regarded as *premature*, though the fœtus may live to advanced life. The only difference, then, between *abortion* and *premature delivery*, is that in the one case the fœtus is not capable of sustaining an extra-uterine existence, while in the other it is.

Abortion is always an unpleasant, though not usually a dangerous accident, unless combined with excessive hemorrhage. In some cases it occurs as the consequence of ill health, while in others, it may produce ill health by its frequent occurrence. In either case the occurrence of this accident is to be deprecated, and every attempt should be made, on the part of the physician, to prevent it, when it threatens, to arrest the hemorrhage consequent upon its occurrence, and above all to break up, if possible, that morbid condition of the system, which renders its occurrence habitual. To fulfil these important duties, the causes, symptoms, and treatment of abortion must be carefully studied, and it is to the consi-

deration of this subject, that we propose now to call the attention of the student.

Abortion takes place most frequently during the first two or three months of pregnancy. This fact has been denied by Mad. Lachapelle, but upon very erroneous grounds. The reason of its frequent occurrence, at this early period of pregnancy, is explicable by the fact, that at this time the connexion formed between the *ovum* and the *uterus* is much more delicate, much more easily ruptured than when the term of utero-gestation is more advanced.

Causes.—The causes of abortion are exceedingly numerous, and may be classed under two heads, viz., those referable to the mother, and those dependent upon the state of the ovum.

1st. *Of those causes referrible to the Mother.*—It does not appear that any particular constitution is more liable to this accident than others. Females of a delicate and nervous disposition, are, from their extreme susceptibility to various impressions, frequently subject to abortion; but at the same time, those of plethoric habit, who menstruate copiously, are also exceedingly liable to this accident. In all cases, but especially in the plethoric, the abortion is more apt to occur during the *menstrual molimen*, though at this period, no discharge takes place. Those females who lead sedentary lives, and those who live idly and luxuriously, seem equally susceptible to the early discharge of the ovum, as those engaged in laborious occupations.

The occurrence of any acute disease, during the existence of pregnancy, sometimes acts indirectly in producing abortion or premature delivery.

Females who have been irregular in their catamenia; who are affected with leucorrhœa, or syphilis, seem to be predisposed to abortion. Syphilis, or any confirmed chronic disease in either parent, frequently acts as a predisposing cause to abortion.

Tumours of the uterus, whatever may be their nature, are frequent causes of abortion. These tumours may interfere mechanically with the gradual enlargement of the embryo, or they may be connected with undue irritability of the uterine fibres, and in either case they may serve to produce abortion.

Acute or chronic diseases of the uterus, in a majority of cases,

prevent the pregnancy from reaching its full term. Abortion may also be dependent upon disease of the ovaries, the fallopian tubes, but more especially upon old adhesions, existing as the result of previous peritonitis.

Tumours of the ovaries or pelvis, or deformities of the latter will, by mechanical interference, induce the premature discharge of the embryo.

In some cases, there appears to exist an undue irritability of the muscular fibres of the uterus, which prevents the retention of the product of conception within the uterine cavity.

In other cases the abortion is accidentally produced by blows, or falls upon the abdomen, by mental and moral emotions, &c. It is extremely probable that mental and moral emotions would rarely be sufficient to produce the premature discharge of the embryo, unless there existed some predisposition to abortion. The same remark might be made in regard to many of the causes which have been recorded as productive of abortion.

Displacements of the womb may induce abortion and it is probable that *retroversio uteri* is not an uncommon cause of this accident.

Abortion is sometimes produced by the imprudent use of drastic purgatives, or the use of medicines which act specifically upon the contractile fibres of the uterus. These and other means are frequently resorted to for criminal purposes.

2d. *Causes referrible to the fœtus*.—It is a well-established fact in medicine, that the fœtus in utero is frequently affected with the diseases of the parent; thus, scarlet fever, measles, small-pox, syphilis, &c., occasionally are transmitted to the fœtus, and the effects produced upon its health are probably more serious than where a healthy child is attacked with these diseases after birth. It is not surprising then, that the existence of these diseases in the parent should predispose to abortion, since it is easily comprehended, that the fœtus may be affected in a similar way. If the death of the fœtus take place, it of course acts as a foreign body, and will sooner or later be expelled; or both the mother and the embryo may survive, while the connexion between the uterus and the fœtal membranes, will become so frail as to render abortion

almost inevitable, especially where the mother is by extreme debility rendered very susceptible to impressions of every kind.

The disease of the ovum, independent of any infirmity on the part of the mother, is certainly the most common cause of abortion. As its disease advances, its connexion with the uterus becomes destroyed, and the embryo, acting as a foreign body, is soon expelled.

The pathology of the human *ovum*, though it has been much studied, is as yet but little understood, nor is it possible, previous to the expulsion of the *ovum*, to predetermine its pathological state.

Atrophy or hypertrophy of the placenta may occur, and by weakening its connexion with the uterus, may become the cause of abortion. Other changes are observable in the placenta, which are productive of abortion: thus this body may be inflamed, or ossified, or converted into a mass of hydatids. A collection of bloody clots is occasionally found between the placenta and the uterus. As these clots go on increasing in size, the separation of the placenta is effected, and abortion takes place. This affection has been termed by M. Cruveilhier *placental apoplexy*.

The collection of clots of blood between the uterus and the chorion, may also produce the same effect.

Undue shortening of the cord and its unnatural torsion have been mentioned as causes of abortion. That they may produce this effect, is true, but such cases are of very rare occurrence, though they have been reported by Mauriceau, Stein, Guillemot, Deneux, &c.

Diseases of any portion of the foetal membranes may act as a cause of abortion.

In those cases, where abortion takes place habitually, at a certain period of pregnancy, the cause is referrible to the excitation produced in the uterine system, by the periodical occurrence of the *menstrual molimen*.

Symptoms of Abortion.—The period of pregnancy at which abortion occurs, and the cause which produces it, modify the symptoms very much. When the expulsion occurs during the first days of pregnancy, it is preceded by no premonitory symptoms,

and is accomplished with but little pain. In this instance the *ovum* is expelled *entire*, and is sometimes so enveloped in blood as to escape detection. Where the pregnancy is farther advanced, and where the abortion is effected in a slow, gradual manner, the following premonitory symptoms are observable:—the female is languid and uneasy, great despondency, chills alternating with flushes of heat, nausea, palpitations, coldness of the extremities, a sense of weight about the vulva, frequent desire to evacuate the bladder and rectum; the breasts become flaccid: when these precursory signs have existed for some time, they are succeeded by pain in the loins, extending over the abdomen; these pains are intermittent in their character; a sanious, fetid, and bloody discharge takes place from the vagina; the movements of the *fœtus* are no longer observable; the pains increase and are accompanied by more or less hemorrhage, when the embryo is discharged, either enveloped or not in its membranes.

The expulsion of the uterine contents may take place very soon after the occurrence of the premonitory symptoms of abortion, or it may be deferred some three or four weeks after the death of the *fœtus*. In some cases, the retention of the dead *fœtus* produces but little effect upon the health of the female; in others, especially where putrefaction occurs, it occasions severe irritative fever, which gradually wears out the constitution of the mother. These ill effects are more apt to occur where the bag of membranes have become ruptured, so as to expose the *fœtus* to the influence of air, &c.

When abortion is the result of an accident, the separation of the *ovum* from the uterus and its expulsion may take place gradually, as in the case above described. Most usually, however, the accident is followed by abundant hemorrhage, a cessation of the *fœtal* movements, the occurrence of pain, and the quick expulsion of the *fœtus*; or the accident may, for a short time, be followed by none of these symptoms, and the female may suppose herself safe, when the hemorrhage, pain, &c., may come on, and the expulsion be effected. In some cases, the *fœtus* may be expelled in a living condition. If, however, after one of these accidents, the *fœtal* motions be no longer felt, the ultimate expulsion of the *fœtus* be-

comes inevitable, even though neither pain nor hemorrhage have as yet occurred.

The discharge of the liquor amnii is almost a sure sign that abortion will take place sooner or later. No fixed time for the expulsion of the embryo, after its death, can be determined; nor should we as long as the embryo lives (as may be ascertained by auscultation, and by its movements) despair in preventing its expulsion from the uterus.

As a general rule, the more gradually the abortion is in being produced, the less is the danger from hemorrhage to be feared.

When the expulsion of the fœtus is about to occur, the os uteri dilates, and the contents are expelled as in ordinary cases of delivery. It must be remembered, however, that the dilatation of the parts, if the embryo be large, is effected with more difficulty than where delivery occurs at full term.

In twin cases, one embryo may be discharged, while the other is carried to the full term; this is not usually the case, since in a majority of instances both embryos are expelled simultaneously.

Diagnosis.—If abortion were always preceded by the premonitory symptoms already described, its diagnosis would be comparatively easy. Unfortunately this is not always the case, and where the precursory signs are wanting, the expulsion of the immature ovum may take place before the advice of a physician has been called for. It is useless to say how very essential it is for the physician to be warned at the earliest moment of the approach of abortion, since it is at that time that his remedial efforts meet with most success in arresting this unnatural tendency.

The pains attendant upon difficult menstruation, resemble very much those which precede abortion, but the determination of the existence of pregnancy will serve to enlighten the diagnosis.

In all hemorrhages, occurring during pregnancy, we are justified fully in suspecting the approach of abortion, and every effort should be made to prevent its farther progress.

Prognosis.—The occurrence of abortion is attended with more danger to the mother, than where the delivery is accomplished in a natural way, at the full term of utero-gestation. Natural delivery, more frequently than abortion, is followed by those fevers peculiar

to parturient women, while the latter gives rise to many chronic diseases of the uterus, ovaries, &c.

The period of pregnancy at which abortion takes place, has considerable influence upon the prognosis; thus its occurrence during the first or second month may not be accompanied with or followed by symptoms of any gravity; but during the third and fourth month, the expulsion of the embryo is both difficult and dangerous, owing to the condition of the os uteri, which is exceedingly unfavourable to dilatation. Some authors think it is more so at this time than at a more advanced period of pregnancy. The danger from hemorrhage is, *cæteris paribus*, greater the more the pregnancy is advanced. Where, from accidental causes, the abortion takes place suddenly, the danger from hemorrhage is much greater than where its approach is gradual. On the other hand, the effects upon the constitution are more to be dreaded in those cases in which the abortion comes on gradually, than where it is rapidly accomplished.

Treatment.—This will depend upon the condition in which the patient is found; and in order to give a clear conception of the mode of treatment, we will consider separately, each point which may demand special attention.

When abortion comes on gradually, and is preceded by the precursory symptoms, already alluded to, the following plan should be pursued. The patient should be kept in the recumbent position as much as possible. If she be plethoric, a moderate bleeding may be prescribed, at the same time that opium, either by the mouth or by injection, be employed for the purpose of quieting the disposition to uterine contraction, and of allaying the nervous irritability existing in the system. The diet in those of full habit, should be unirritating and somewhat restricted in quantity. Where the female is of delicate constitution, the same plan may be pursued as above recommended, with the exception of the venesection and the restriction of the diet. The former should on no account be resorted to, while the diet should be nutritious, at the same time, that tonics may be cautiously administered.

Where the hemorrhage is great, rest in the recumbent position,

the use of the tampon, and the employment of astringents, must be resorted to.

If, in spite of this treatment, the expulsive efforts become violent, with much hemorrhage, the prevention of abortion is rendered almost impossible, but at the same time we should not desist from the employment of the means above recommended. In some cases, the embryo is discharged enveloped in its membranes, and this is the most favourable case. In other instances, the fœtus is expelled while the enveloping membranes are retained. As long as the membranes are retained there is danger of hemorrhage, and if the uterine contractions are incapable of effecting their separation and discharge, the use of ergot may be resorted to. Where this fails, the hand must be introduced into the vagina, so that with one or two fingers, we may hook down the membranes, which most usually either protrude through the os uteri or are placed just above it. No force must be used in introducing the finger, and we should remember that at this period of pregnancy, the uterus is small and its mouth undilated and rigid, and therefore no attempt should be made to introduce more than two or three fingers into its cavity. If the membranes cannot be drawn down with the fingers, a hook, made for that purpose, may be advantageously employed.

If the hemorrhage continues unabated, and the membranes cannot be extracted by the means already alluded to, the use of ergot, cold applications, the application of galvanism, &c., must be persevered in, till the separation and expulsion are effected.

In some cases the membranes remain within the uterine cavity so long, that their putrefaction takes place, and irritative fever is excited, which may prove dangerous. Here every effort having been made to extract the membranes, but without success, nothing is left to the physician but to support the strength of the patient. At the same time the uterus should be syringed out frequently, so as to remove the putrefying material as soon as it forms. In other instances the membranes are retained, but instead of becoming putrid, they are variously transformed into hydatids, moles, &c. In the chapter on retention of the placenta after birth, we have

alluded to some cases, in which the placental mass, instead of being expelled, is absorbed into the system; the same thing may occur where the membranes are retained, after a premature expulsion of the embryo.

Uterine hemorrhage, after the embryo and its membranes have been discharged, is to be managed in a way precisely similar to that recommended in cases of flooding after delivery at full term. When abortion takes place very early in pregnancy, the use of the tampon need not be dreaded, for the uterus is so small, that it will not permit any great accumulation of blood within its cavity, and therefore there is little danger of converting an external into an internal hemorrhage. Where the cavity of the uterus is large, the employment of the tampon, after the product of conception has been discharged, is highly objectionable.

Where abortion has once occurred, we have reason to expect its recurrence at the subsequent pregnancy, unless it be prevented by appropriate means. In these cases we should direct our attention to the discovery of the cause of the accident, and when this is ascertained, those remedies should be employed which are calculated to render it ineffective. Thus if the parents be affected with syphilis, it will become necessary to eradicate this disease by appropriate remedies; so in regard to any other disease, either local or general, with which the patient may be affected.

If the abortion takes place, as it often does, at a regular time of pregnancy, the patient should at this time be placed in the recumbent position, upon a hard mattress, and in a cool room, and subjected to the plan of treatment appropriate to each particular case. This course should be persevered in until the *aborting period* has passed by.

In the treatment of cases of abortion, during the intermission, of course the condition of the patient will be our guide; thus anemic or chlorotic persons should be treated with tonics, while those who are plethoric, will require depletion. In cases of dysmenorrhea, accompanied by abortion, the functions of the uterine system should be attended to.

If, notwithstanding our attempts to eradicate the cause, both

moral and physical, of abortion, it should still habitually persist, the best advice which the physician can give, will be to advise the discontinuance, for a considerable time, of all sexual intercourse, so as to permit the uterus to regain its healthy condition. In many cases, unless this be done, the abortion occurs time after time, until the constitution of the patient is completely destroyed.

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